A WAR-TIME STUDY OF PEPTIC ULCER; WITH THE ACCOUNT OF AN EXPERIMENT IN THE REHABILITATION AND EMPLOYMENT OF MEN WITH HEALED PEPTIC ULCERS IN THE ROYAL NAVY.

by

JAMES WRIGHT RAE, M.B., Ch.B.

Thesis Presented

for the Degree of M.D.

September 1947.

TABLE OF CONTENTS.

The/

INTRODUCTION.

The second world war had been in progress for only a very short time when it became evident that digestive disorders were going to form one of the major medical problems in the fighting services. This was in marked contrast to the 1914-18 war in which gastric disturbances, and peptic ulceration in particular, were comparatively uncommon amongst soldiers. In drawing attention to this fact Tidy (1943) shows the relative incidence of peptic ulcer in the two wars by the following statement:- "In the last war up to the end of 1915 (Medical History of the War, 1931) the discharges from the Army for "inflammation and ulceration of the stomach" were 709. In the present war the number discharged for peptic ulcer to December, 1941, was 23,574." Hurst(1944) quotes an official statement of May 1942 which gave the information that 17 per cent of the total discharges from the Army and the Royal Air Force and 13.8 per cent from the Royal Navy were on account of digestive disorders.

One of the earliest papers on the incidence of gastric disease in the armed forces during the 1939-45 war was that of Willcox (1940) who studied a convoy of cases admitted to a sector hospital from France on 12th November, 1939. Of 238 cases, 174 were medical, of/

of which 41 or 23.5 per cent were cases of primary gastro-duodenal disorders and in relative incidence they out-classed in number any other disability. Most of the cases were of long standing and in only one patient had symptoms arisen for the first time during army service since the onset of the war. The first extensive investigation of the problem was made by Payne and Newman (1940) who studied 287 cases of dyspepsia in the B.E.F. and in troops in the United Kingdom between February and April 1940. It was found that gastro-duodenal dyspepsia accounted for 12.5 per cent of all sick evacuated to the United Kingdom and was the largest single cause of illness in the B.E.F. Gross organic disease was found in 89 per cent of cases, most of these having peptic ulcers. There were 226 cases of proved ulcer and 21 cases of probable ulcer, the ratio of duodenal to gastric ulcer being 4 to 1. The most significant feature of this investigation was that 92 per cent of the ulcers originated in civilian life before the war and only 8 per cent appeared to have originated during army service. The majority of later studies showed results broadly similar to those of Payne and Newman, with the exception that the incidence of peptic ulcer was somewhat lower, the average being about 50 per cent of all cases of dyspepsia. Some of the actual figures were/

were 42.8 per cent (Morris,1940), 64.2 per cent (Graham and Kerr,1941), 38.7 per cent (Saffley,1941), 32 per cent (Spillane,1941), Brockbank,1942)42.5 per cent and 28.5 per cent (Gill, Berridge and Jones, 1942). The high incidence of ulceration in the earlier studies appeared to be due to the fact that a large proportion of the cases during the first year of the war occurred in reservists and pensioners between the ages of thirty and forty (Allison and Thomas, 1941b). Hinds-Howell (1942) compared the figures of dyspepsia at a "static" military hospital for 1940 and 1941 and found that while there was an increase of 2.8 per cent in 1941 for all types of dyspepsia, peptic ulceration fell by 12 per cent and gastro-duodenal dyspepsia by 6 per cent. In making the comparison this author points out that while there may have been a reduction in the number of reservists affected during 1941, it must be remembered that many of this class had already been discharged in 1940.

Many other excellent papers, including those of Hutchison (1941), Hinds-Howell (1941), Smellie (1942), Fletcher (1942), Montgomery (1942), Wade (1942;1943), Hill (1943), Rook (1943), Edwards and Copeman (1943), MacNab (1943) and Conybeare (1943) all told a similar tale of the problem in the British fighting services. The magnitude of the incidence of dyspepsia in the forces/

forces at first took the medical profession by surprise (Tidy, 1943) but as succeeding investigations confirmed the fact that the majority of men admitted to service hospitals with peptic ulcer had suffered from gastro-duodenal dyspepsia before they entered the services, it was generally agreed that the picture was only a reflection of the incidence of organic dyspepsia in the civilian population, the extent of which had not hitherto been realised. It had however been established that there was a considerable increase in peptic ulceration between the two wars (Hinton,1933; Wolfert, 1937; Rivers and Ferreira,1938) but this had received little attention in this country although Wilkie (1927) had noted the increase in cases of perforation and considered that the total incidence of the disease was rising. This was also noted by Ryle (1932) and has since been proved conclusively by the statistical studies of Jennings (1940), Tidy (1944a;1945), Illingworth, Scott and Jamieson (1944) and Morris and Titmuss (1944).

At the time of America's entry into the war statistics were available from the British Services which indicated that the United States Authorities should be prepared to meet a similar situation. This was recognized by the appointment of specialists in gastro-enterology to all large military hospitals, a policy/

policy which Boles (1942) considered would prove of great benefit to the Army. The earlier papers from American sources (Dunn,1942; Palmer, 1942) were chiefly concerned with surveying the available evidence relating to digestive disease and military service, most of which was based on literature from Britain. Kantor(1942) however, quoted peace-time figures to show that since 1930, the incidence of duodenal ulcer had increased in the United States Army as well as in the civilian population. It was not long before it became obvious that dyspepsia was proving to be just as great a problem in the American Forces as it had shown itself to be in the British Forces and amongst many others, the papers of Chamberlin (1942;1943), Schindler (1942), Flood (1943), Kirk (1943), Pincus (1943), Rush (1943), Thomas (1943), Berk and Frediani (1944), Rosenah and Foltz (1945) and Zetzel (1944) discussed various aspects of the problem in the Army while the impact of digestive disorders on the manpower of the United States Navy was described by Walters and Butt (1943),Logan and Bransford (1943), Loe and Berger (1944), Monat and Carleton (1944), Hook and Keane (1945) and Twiss and Parsonnet (1945). The much smaller size of the Canadian Forces enabled their medical authorities to obtain a more complete picture of the peptic ulcer problem than was possible in the British or United States/

States Forces and the details have been ably supplied by Urquhart, Singleton and Feasby (1941), Feasby (1944), and Lane (1944; 1945).

Such literature as was available in this country after 1939 showed that the problem of dyspepsia was no less serious in the armed forces and in the civilian population of Germany (Teschendorf, 1939; Gmeiner,1941; Metz,1941; Henkel,1942; Slany,1942; Tidow and Nekarda, 1943; Kalk,1943; Manke,1944),and evidence has been brought forward by Brühl(1942) and Géronne (1943) which suggests that there was a true increase in the incidence of dyspepsia and peptic ulcer during the war.
In Russia also,the medical profession was faced with a similar state of affairs (Nikolaev,1943; Kogan-Yasney, 1945) but there has been ample evidence to show that it was not confined to the combatant countries. Thus Markoff (1943) states that peptic ulceration has doubled in incidence among the civil population of Switzerland since 1930 and the relationship of gastric disorders to military service in the Swiss Army is discussed by this author and by Demole (1941) and Haemmerli (1941). Sällström (1945) found that there was a considerable increase in the number of ulcer cases treated in hospital in Sweden during the war but was unable to decide with any certainty whether the actual incidence of the disease had increased or whether/

whether it could be attributed to the increased difficulty of providing a suitable dietary at home.

There has been no evidence that the incidence of peptic ulcer increased in this country during the war but a considerable increase in cases of perforation was noted during the anxious years of 1940 and 1941 (Stewart and Winser,1942; Spicer, Stewart and Winser,1944; Illingworth,1947). In a discussion on dyspepsia in the armed forces at The Royal Society of Medicine, Tidy (1941) stated:- "It should be realised that there is no evidence that the present war has been accompanied by any increase in the incidence of peptic ulcer or other severe gastric disturbances. What the present war has so far revealed is the unsuspected frequency of peptic ulcer and gastritis in the civilian population before the war commenced and the not surprising fact that organic dyspepsia is incompatible with Army Life." A leading article in the "British Medical Journal" (1940) summed up the situation with the statement that "the Army still marches on its stomach even though it travels in mechanized vehicles."

The real importance of the high incidence of peptic ulcer lay in its position as a cause of unfitness for duty and of invaliding or as Allison and Thomas (1941a) have expressed it, "the significance of any disease in the fighting services depends on its capacity to cause unfitness for duty." The chief problem/

problem in the armed forces therefore, after accurate diagnosis, was the disposal of cases and their ultimate prognosis in relation to their service. It is with this question, as it affected the Royal Navy, that the present thesis will be mainly concerned.

DISPOSAL OF CASES OF PEPTIC ULCER IN THE FIGHTING SERVICES.

In the view of Hurst (1941; 1944) no man who presents definite evidence of having had a peptic ulcer should be accepted for service in the armed forces however long he may have been free from symptoms. Tidy (1941) recommended that men with peptic ulcers should be invalided without delay and stated that the diagnosis might be justifiable in some cases on clinical grounds. Both of these authorities agreed that whereas many men with ulcers were able to keep going on a comparatively restricted regime in civilian life, they readily broke down and had a recurrence of symptoms sooner or later after joining the armed forces. Tidy also considered that relapses occurred more quickly in the Army than in civil life and that the impossibility of dieting and maintaining a proper regime was the main reason for the breakdown in the Army of patients with organic dyspepsia. In a later review of peptic ulcer and dyspepsia in the Army, the same/

same author (Tidy, 1943) stated that the policy of the Army was to invalid from the service all men with the accepted diagnosis of peptic ulcer with exceptions in the case of key men. Attempts to return cases to ordinary duty in the early period of the war had proved consistently unsuccessful. The official figures quoted by Hurst (1944) showed that the disposal of men with chronic dyspepsia was an equally large problem in the Army and the Royal Air Force but was apparently slightly smaller in the Royal Navy. The lower percentage of cases discharged from the Royal Navy was considered by Tidy (1944b) to be due to attempts to retain a higher proportion of cases than was done in the other two services, especially in the first eighteen months of the war. This was contrary to the view of Rook (1943) who considered that the proportion of cases of peptic ulcer returning to duty was probably largest in the Royal Air Force, because the proportion of skilled technicians was high and every attempt was made to keep valuable men in the service. The opportunity of placing these men in sheltered occupations and even allowing them to live in their own homes was greater in the Royal Air Force than in the other services. Smellie (1942) on the other hand, considered that whenever the diagnosis of ulcer could be established, the soldier should be invalided, and returned to civilian life in the shortest possible time.

Logan and Bransford (1943) in pointing out that in past years only 20 per cent of those suffering from peptic ulcer were invalided from the United States Navy, consider that only those ulcer patients who are definitely indispensable and whose case histories are most innocuous should be recommended for return to duty. Chamberlin (1943) stated that the peptic ulcer patient is unfit for military service and should not be retained unless unusual circumstances exist. Kantor(1942) considered that officers, being more able to look after their diets were acceptable for limited service while Palmer (1942) felt that men with peptic ulcers could be used for duties within the United States under conditions which would allow them to follow a dietetic regime. Schindler (1942) was of the same view but only in the event of total mobilisation being necessary and considered that cases of proved ulcer or chronic gastritis should be classified as totally and permanently unfit for military service as long as high standards could be maintained.

It was therefore generally agreed that peptic ulceration should be a bar to service in the armed forces but a majority of authors qualified this opinion with the proviso that highly qualified key men might justifiably be retained under certain conditions. It is evident however, from a study of many of the papers/

papers from both British and American sources, in which this question is discussed, that there was no clearly defined or uniform policy with regard to the suitability of individual cases for retention in any particular category or with regard to the conditions under which such cases might be employed. In the Royal Air Force, for example, Rook (1943) stated that the methods of disposal of cases of peptic ulceration were formulated before the onset of the war and had remained substantially unaltered. According to Conybeare (1943) however, a large proportion of Royal Air Force personnel were treated in E.M.S. hospitals where the standards of what constituted an invaliding disability varied from hospital to hospital. This author also stated that it was extremely difficult, if not impossible, to get any comprehensive picture of the problem of dyspepsia or to enforce any definite policy with regard to either the duration and type of treatment, or even the general principles as regards invaliding from the service.

THE RETENTION IN THE ARMED FORCES OF MEN WITH PEPTIC ULCERS.

As already noted, the main cause of the early recurrence of symptoms in the subjects of peptic ulcer in the fighting services was considered to be the impossibility/

impossibility of dieting and the inability to keep to a proper regime (Tidy, 1941). That service in the forces is not however, of itself, incompatible with freedom from relapse has also been shown, particularly in the case of officers who are usually more able to carry out a strict regime than is the case with other ranks. Thus Hurst (1941; 1944) has recorded that he saw several officers in the 1914-18 war who had duodenal ulcers and who were able to look after themselves in France or in the East sufficiently well to remain free from symptoms. Graham and Kerr (1941) also noted that officers could often carry on in comfort in France during the early part of the recent war until active hostilities precluded a suitable diet. In this connection, the severe physical strain and irregular meals before the evacuation of France in 1940 undoubtedly had an adverse effect. This had also been noted in ulcer patients after the Norwegian campaign.

In his review of the prognosis in 194 cases of peptic ulcer who had been retained in the Royal Air Force, Rook (1943) stated that the subsequent history of some of these cases suggested that help in disposal might be obtained from the rank of the patients, for the higher the rank the more likely is the patient able to carry on. Neither the length of the history nor/

nor any of the various criteria of diagnosis appeared to offer any guidance as to whether or not an airman, after treatment for peptic ulceration, was likely to withstand service life.

THE PROVISION OF SPECIAL FACILITIES IN THE SERVICES FOR MEN WITH PEPTIC ULCER.

The incidence of chronic dyspepsia and peptic ulcer was so large a cause of wastage in manpower that the possibility of attempting to retain the services of such cases by the provision of dietetic facilities was seriously considered and actually put into practice in the German Army by the formation of special units for troops suffering from digestive disorders (British Medical Journal, 1944). A similar suggestion was made by a committee of gastro-enterologists in Switzerland (Demole, 1941) with a view to dealing with the problem of dyspepsia in the conscript army of that country. The management of cases of peptic ulcer who were retained in the Royal Canadian Navy has been described by Lane (1944; 1945) and Goldbloom and Schildkrout (1944) have discussed the results of a scheme for the rehabilitation of cases of chronic dyspepsia in the United States Army.

In the British Army, according to Tidy (1943), the number of cases was so large that many suggestions were made/

made for retaining men in the service in some suitable role, varying from special "ulcer battalions" to "light duty" - a form of duty which, when prolonged, usually resulted in a negligible output. The Army would need to arrange not only special diet for an ulcer unit but also a special routine for times of meals - more difficult, and in the opinion of the author (Tidy) equally important, and the unit would need to be undisturbed by a high ratio of sickness. If a man reported sick with a recurrence of symptoms the medical officer could rarely avoid sending him off duty. No existing unit or category in the Army meets these requirements on a large scale and Tidy doubted if such a formation would pay a dividend, but stated that conditions might differ in the other services. The conception of special "ulcer units" had also been considered by the Royal Air Force but according to Rook (1943) an attempt to carry out such a scheme on a small scale met with administrative and other difficulties and was abandoned.
Love (1943) however believed that it would be possible to reclaim as useful soldiers 40 to 50 per cent of dyspeptics by means of a rehabilitation scheme.

THE PROBLEM OF PEPTIC ULCER IN THE ROYAL NAVY.

Although the disease is not even mentioned in the Naval Medical History of the 1914-18 war, the increasing importance/

importance of peptic ulcer as a cause of disability amongst sailors was well recognised in the Royal Navy between the two world wars. Thus Burdett (1931), in reviewing the returns between 1911 and 1929, noted the growing frequency of the disease and suggested that the cause might be the enormous diminution in physical effort which had been the outstanding change in naval life since 1911. As was the case in the other services, the expansion of the Navy following the outbreak of war was accompanied by a disproportionate rise in the incidence of peptic ulcer. The effect on the annual invaliding rate in comparison with pre-war years is shown in Table 1, from which it is seen that the invaliding rate from peptic ulcer rose to a maximum in 1941 and thereafter declined.

TABLE 1.

INVALIDING DUE TO PEPTIC ULCER IN THE ROYAL NAVY.

Annual Rates per 1,000 strength. (Officers excluded)

	1934-8	1939.	1940.	1941.	1942.	1943.	1944.
Crude Rate	0.46++	1.06++	1.77	2.93++	2.15++	1.38++	1.24++
Age Adjusted Rate	0.46++	0.90++	1.71	3.00++	2.32++	1.64	1.43++

Notes on Table 1.

1. + indicates a significant difference from the corresponding rate for 1940.
2. Age adjusted rates are the rates which would have been observed had the age composition of the Navy remained at the average for the period 1934-8.

The general picture of peptic ulcer in the Navy during the first eighteen months of the war has been described by Allison and Thomas (1941a, b.) who investigated one hundred cases from the points of view of symptomatology, pathology and aetiology. The symptoms were of long duration in almost all cases and in only seven per cent had they begun after the outbreak of war. The dyspepsia was typical of peptic ulcer but the clinical picture differed, however, from that experienced in peace-time in the following respects:-

(a) The pain was usually more severe and recurred at shorter intervals. It was often continuous and unrelieved by food or alkalis.

(b) Attempts to carry on and eat ordinary food led to frequent vomiting and great loss of weight. The most frequent accompaniments of undernutrition and continuous dyspepsia were pallor and anxiety.

(c) Acute gastrointestinal complications were more common. The majority of dyspeptics seen in hospital in the first year of the war were chronic cases - men who had contrived to keep going in peace-time but had broken down in war. The view was expressed however, that the problem was changing and would change more as these men were gradually replaced by younger men whose symptoms were likely to be more recent and less well defined. The general conclusions were thus much the same as those of Willcox (1940), Payne and Newman (1940), and/

and Graham and Kerr (1941), all of whom investigated the problem in the Army at the same stage of the war.

Wade (1942) reviewed a series of 1,003 consecutive cases of dyspepsia admitted to a large Royal Naval Auxiliary Hospital between October 1939 and September 1941. The findings in this study bore a close similarity to those from other service hospitals in regard to the incidence of peptic ulcer while the early onset of symptoms and of complications was particularly noted.

THE DISPOSAL OF CASES OF PEPTIC ULCER IN THE ROYAL NAVY.

According to the report of the Medical-Director General on the health of the Navy for 1935, the most prolific cause of wastage among diseases of the digestive system was duodenal ulcer, which in 102 cases, produced 31 invalidings and 3 deaths. In the same year, gastric ulcer accounted for 97 cases with 10 invalidings and 5 deaths (Allison and Thomas, 1941a). It is clear from these figures that the majority of naval ratings who developed peptic ulcer in peace-time were retained in the service. A further illustration of this is provided by Wakeley (1944) who found that 44 per cent of a series of 103 cases of perforated peptic ulcer were still serving in the Royal Navy nine to twenty years after operation.

In the early part of the war, the peace-time practice of treating cases and returning them to duty when/

when free of symptoms was continued in most hospitals. According to Allison and Thomas, when cases of dyspepsia did well under treatment, they were usually discharged from hospital with a recommendation for a period of shore service, or service only in a ship carrying a medical officer. These authors stated however, that some form of supervision was clearly necessary to ensure that such cases were followed up, and to consider the aetiological factors involved in bringing about possible future recurrences of their dyspepsia.

The experience of the unexpectedly large incidence of digestive disorders during the first year of the war made the problem of disposal more difficult and emphasised the necessity of having a clearly defined policy to ensure uniformity with regard to the invaliding of peptic ulcer cases. Such a policy was formulated in March 1941 at a meeting of representatives of the medical sections of the various Naval Hospitals held in the Medical Department of the Admiralty (Wade, 1942). It was recommended that cases of proved active ulceration and those with recurrence of symptoms, in the absence of radiological confirmation but with a definite past history of perforation, haemorrhage or gastro-duodenal operation, should be invalided from the service. Exceptions were to be made in the case of officers and specialist ratings (key/

(key men) especially those who were serving under long service engagements, but each case was to be judged on its merits. The immediate effect of these recommendations was, according to Wade, the invaliding of a larger number of cases during the next few months. This may partially account for the fact that 1941 was the peak year for invaliding on account of peptic ulcer. Officers and key men were, when suitable, discharged to shore service with advice as to subsequent dietary control. This policy also made it possible to maintain a fairly uniform standard with regard to the criteria of invaliding, a position which was not achieved in the Royal Air Force (Conybeare, 1943) and which appears to have been difficult to attain in the Army (Hinds-Howell, 1942).

EFFECTS OF INVALIDING ON THE MANPOWER SITUATION IN THE ROYAL NAVY.

In discussing an analysis of invalidings in The Royal Navy due to disease and deaths due to disease between 1934 and 1943, Greenwood (1944) noted that compared with the pre-war figures, the total wastage rate from invaliding increased by about 45 per cent during the war. The items of greatest numerical importance are Pulmonary Tuberculosis, Mental Disorders (including psychoneuroses and mental deficiency), and Peptic/

Peptic Ulcer. In 1934-8 these three causes accounted for about 35 per cent of the whole invaliding rate (age adjusted); in 1942 they accounted for more than half the total. A close parallel trend between mental disease and peptic ulcer was noted during the war years.

Throughout the whole of the recent war the Royal Navy had to withstand an unremitting call on its resources of ships and personnel and it was therefore essential that every effort should be made to avoid any wastage of manpower, particularly in the skilled technical branches. The latter were of particular importance in the maintenance and manning of destroyers and smaller vessels in which every man had to pull his full weight. Every fit man spent a minimum of time in shore appointments and the majority of home ports, including many temporary wartime bases, were being increasingly manned by elderly pensioners and members of the W.R.N.S. in order to release more fit men for service in sea-going ships.

As the war showed signs of becoming prolonged and the likelihood of having to face a possible shortage of manpower was realised, it was natural that the Admiralty should consider the most suitable means of reducing the loss of skilled men through invaliding. Of the three causes of invaliding already mentioned, tuberculosis was being attacked by the use of mass miniature/

miniature radiography (Dudley, 1941), so that the early detection of the disease would be expected to reduce the numbers of well developed cases coming forward for invaliding. The salvage of cases of psychoneurosis, men of low morale and constitutional inferiority was next considered and centres for the rehabilitation of such cases were formed in 1941 and 1942. The work and the successful results of these two centres have been described by Forbes (1944) and Prewer (1945). In 1944, after some unavoidable delay, an experimental scheme for the rehabilitation and employment of men with healed peptic ulcer was established. The writer held the appointment of Medical Officer to this scheme for a period of nearly twelve months, and the present thesis will give an account of the establishment and working of the experiment together with the results, which have not so far been published.

THE FATE OF MEN WITH PEPTIC ULCER ON BEING RETAINED IN THE NAVY.

As already pointed out, ratings with peptic ulcer who were retained in the service after a period of adequate treatment were generally discharged ot a period of shore service in the United Kingdom, and were also given advice with regard to a suitable regime. In the absence of any special dietetic facilities the dyspeptic sailor/

sailor either had to make the best of it on general mess feeding or he could be granted lodging and provision allowance, in which case he lived ashore and was responsible for providing his own meals. This alternative course could only be followed by a small number of ratings and the remainder thus had to be victualled on general messing and in many cases tried to supplement their diet by purchasing meals ashore. In a few cases, if the local conditions permitted, it was possible to victual a man in the Sick Bay on a suitable diet, while allowing him to carry out his ordinary duties. Such an arrangement could only be utilised in a limited number of cases and was not practicable in any of the larger depots. Officers were in a more privileged position and generally found little difficulty in making suitable arrangements with regard to dieting, either ashore or in their own mess. The disposal of ratings thus still remained unsatisfactory and men who were not invalided continued to attribute any return of symptoms to the lack of a suitable diet. It had been clearly shown in the early months of the war that men who were the subjects of gastro-duodenal dyspepsia were unable to tolerate an ordinary service diet (Payne and Newman, 1940; Tidy, 1941; Allison and Thomas, 1941b) and if the policy of retaining suitable cases of healed peptic ulcer in the service was to be continued, the provision of some form/

form of dietetic regime appeared to be essential if further breakdown was to be avoided.

Since the manpower situation was the determining factor in the decision to retain men with peptic ulcers, the provision of suitable work was no less essential than a suitable diet. In order to make the problem quite clear it is necessary to explain the method by which the ships and shore establishments of the Royal Navy are manned and supplied with replacements of personnel. On completion of his preliminary training, a recruit is posted to one of the three Port Divisions or Manning Depots of Chatham, Portsmouth or Devonport, and his movements throughout the whole of his service career are thereafter controlled from that particular depot. For manning and administrative purposes every ship in the Fleet is similarly attached to a Port Division and is manned solely by men from that depot; thus a "Chatham Ship" only carries men of the Chatham Port Division and so on. Shore establishments in the United Kingdom are usually manned in a similar way from the depot within whose area of command they happen to be situated. When a rating is discharged from hospital with a recommendation for a period of shore service he is drafted to the Royal Naval Barracks of his Port Division to await posting to a suitable appointment/

appointment in an establishment within the command, or he may be employed in the depot itself. The "permanent staff" of the depots is at the best of times, limited, and the barracks form little more than transit camps for the majority of men who are posted there. As most ratings remain in barracks for only a short time there can be little opportunity for any regular employment and certainly none for the sheltered type of employment which Rook (1943) found possible in the Royal Air Force. It is true, however, that large numbers of regular service naval ratings have their homes in the vicinity of their Port Divisions, but the heavy air raids during the war substantially reduced their numbers and prevented "hostilities only" personnel from setting up even temporary homes. It is easy to understand therefore, how at any given moment, any of the three Manning Depots might contain a group of men with healed peptic ulcers all of them having been recommended for a period of home shore service.

PROVISION OF SPECIAL DIETETIC FACILITIES FOR NAVAL RATINGS WITH PEPTIC ULCER.

Early in 1943, in view of the manpower situation, the Admiralty decided to consider "the employment of invalided men or men who would otherwise have been invalided,/

invalided, in particular healed gastric and duodenal ulcer cases, on maintenance work and manning harbour servicing craft at the three Home Ports and the larger out-ports." In the meantime, it was decided to provide dietetic facilities in two of the Port Divisions (Chatham and Devonport) in order to accommodate the increasing numbers of men who were being referred from hospital with the diagnosis of peptic ulcer and the recommendation for a period of home shore service. The special diet messes which were thus established were each capable of taking about one hundred ratings, most of whom had been recommended for three to six months shore service. It was obvious from the beginning that these arrangements could only be of an improvised and temporary nature and could thus be regarded as a short term policy until a more suitable solution could be found for dealing with the cases whihh were gradually accumulating in the Royal Naval Barracks.

The formation of these special diet messes undoubtedly eased the lot of the ulcer cases and reduced the wastage of skilled personnel through invaliding. It was soon evident however, that the congregation of large numbers of dyspeptics in barracks was undesirable for the following reasons:-

(1) A number of men still had homes or relatives and friends within the area of the port and it was difficult to prevent them from taking meals ashore. Thus it was found/

found over a test period of time that only 54 per cent of the meals served in the special diet messes were being consumed.

(2) The difficulty of regular supervision was made greater by the frequent changes in the medical staff of the Royal Naval Barracks which for most officers forms only a clearing house between appointments. Coupled with this, there was some difficulty in obtaining adequate medical records from the hospitals and a lack of continuity in the local records.

(3) There was often a lack of suitable employment for skilled ratings in the depots where most of the permanent billets were filled already by older pensioners and others who were unfit for general service. Thus of 25 men selected from the special diet mess in one of the depots, 14 were employed on makeshift work e.g. in working parties, as mess cleaners, stewards and messengers. All of these men were fully trained and highly skilled ratings and their retention in the service was desirable both on the grounds of high morale and efficiency in their respective categories. The employment of such men on casual duties in barracks must inevitably lead to discontent and to deterioration in morale, especially in the case of long service ratings who are apt to feel that whatever future they may/

may still have in the Navy is seriously prejudiced by such conditions of employment.

(4) A very important factor was the lack of a uniform standard in the selection of cases for admission to the special diet messes. The majority were undoubtedly cases of proved peptic ulcer but as there was no uniform control over the type of case sent to the depots there was a tendency for non-ulcer cases to be admitted as well as a few whose reasons for admission to a special diet were negligible if not actually non-existent. In a survey of cases victualled in the special diet messes Abercrombie (1944) discovered one or two ratings who had no complaints other than recent multiple extractions of teeth which made them temporarily unable to masticate ordinary diet. The most illuminating discovery however, was a rating whose sole qualification for a special diet was that he had to gain weight rapidly in order that he might take part in a forthcoming heavyweight boxing contest.

(5) It was also clearly undesirable to have a mess filled with ulcer and non-ulcer cases on account of the adverse effects which each group might have upon the other. Attention has been previously directed to this point by Hurst (1941) who stated that the soldier with functional dyspepsia should be given a rapid course of treatment to restore his ability to eat ordinary/

ordinary army food and face ordinary army life. The non-ulcer cases who found their way into the special diet mess in the Royal Naval Barracks were usually in this category and their ultimate disposal was liable to be much more difficult than that of the organic cases.

The problem of victualling the special diet messes gave little trouble and was in fact the easiest problem to solve as adequate supplies of milk and other suitable additions to the diet were readily made available. The principles governing the choice of diet will be discussed later but the comparison with the ordinary naval rations is shown in the following random samples taken from the weekly menus of the general mess and the special diet mess in the Royal Naval Barracks, Devonport:-

Menu No.1:

General Mess Menu for Week Ending 19th August, 1945.

Day.	Breakfast.	Dinner.	Tea.	Supper.
Monday	Herrings in Tomato Sauce Marmalade	Soup Roast Beef Cabbage Marmalade Pudding	Jam	Faggots and Peas Cocoa
Tuesday	Bacon and Fried Potatoes	Soup Beef Steak Pie Carrots Macaroni Pudding	Rock Bun	Fried Fish and Chips Coffee.
Wednesday	Fried Beef Sausage and Mash	Soup Cold Roast Beef Lettuce & Tomatoes Date Pudding	Golden Syrup	Fried Liver and Onions and Mash Cocoa
Thursday	Scrambled Egg and Fried Bread	Soup Roast Beef Cabbage Rhubard and Custard	Currant Bread	Soup Cheese, Beetroot Spring Onions Coffee
Friday	Bacon and Baked Beans	Soup Roast Mutton Cabbage Raisin Pudding	Radishes	Fried Pork Sausages and Mash Cocoa
Saturday	Fried Fresh Fish	Soup Preserved Meat Lettuce & Tomatoes Baked Sultana Roll	Jam	Layer Pie Marrowfat Peas Coffee
Sunday	Bacon and Egg	Kidney Soup Roast Pork Cabbage Rhubarb & Custard	Fruit Cake	Soup Salmon Beetroot and Lettuce Cocoa

Potatoes served at all dinner meals.
Menu is liable to alteration at short notice.

Menu No.2:

Standing Menu for Ratings on Special Diet: H.M.S. "Drake."

Day.	Breakfast.	Dinner.	Tea.	Supper.
Monday	Porridge Toast Marmalade	Clear Soup Cottage Pie Mashed Potatoes Sieved Cabbage Rice Pudding	Bread and Butter Jam	Boiled or Poached Egg (if available) or Scrambled Eggs Cocoa Bread and Butter
Tuesday	Boiled or Boached Egg or Scrambled Eggs Toast	Clear Soup Mince Meat Mashed Potatoes Vegetables Bread & Butter Pudding (no currants)	Bread and Butter Cake	Boiled or Steamed Fish Boiled Potatoes Bread and Butter Cocoa
Wednesday	Boiled or Steamed Fish and Sauce Bread & Butter	Clear Soup Stewed Steak Mashed Potatoes Stewed Prunes and Custard	Toast Marmalade	Lean Mince Meat Boiled Potatoes Bread and Butter Cocoa
Thursday	Boiled or Poached Egg or Scrambled Eggs Toast	Clear Soup Boiled Ham Mashed Potatoes Vegetables Rice or Sago Pudding	Bread and Butter Jam	Layer Pie Bread and Butter
Friday	Porridge Toast Marmalade	Clear Soup Boiled Mutton and Sauce Mashed Potatoes Vegetables Bread and Butter Pudding (no currants)	Toast Swiss Roll	Boiled or Poached Egg (if available) or Scrambled Eggs Bread and Butter Cocoa
Saturday	Steamed Fish and Sauce Bread & Butter	Clear Soup Boiled Fish Mashed Potatoes Vegetables Rice Pudding	Bread and Butter Golden Syrup	Clear Soup Cottage Pie Mashed Potatoes
Sunday	Boiled or Poached Egg or Scrambled Eggs Toast Marmalade	Clear Soup Cottage Pie or Boiled Chicken (if available) Mashed Potatoes Vegetables Stewed Prunes and custard	Bread and Butter Cake	Clear Soup Corned Beef Mashed Potatoes

THE ESTABLISHMENT OF SPECIAL UNITS FOR THE EMPLOYMENT OF MEN WITH HEALED PEPTIC ULCERS AT SELECTED NAVAL BASES.

While the special diet messes in the Royal Naval Barracks at Chatham and Devonport were being utilised the Admiralty was considering the practical details of an experimental scheme which would fulfil in the best available way the requirements of retaining and employing men with healed peptic ulcers and at the same time would ensure that the health of the men was maintained by the provision of adequate facilities for suitable dietetic and working conditions. Surgeon Captain R.S. Allison, R.N.V.R. was nominated to exercise general supervision over the scheme and was largely responsible for its formation.

Such an experiment, broadly considered, should be expected to provide answers to the following questions:-

(1) Whether men with healed peptic ulcers can do useful work under medical supervision and dietetic control?

(2) What actually is the natural history of patients with healed peptic ulcers when under strict dietetic control with regular meals and medical supervision? Do they remain free from the symptoms and signs of ulcer?

(3)/

(3) What beneficial, curative or preventive influences may be attributed to regular meals, alkalies or special diet?

From a consideration of peace-time experience an affirmative answer would be expected for the first question since every general practitioner is familiar with cases of peptic ulcer who are able to carry out a full day's work and earn a satisfactory living. It has already been shown that most of the writers on dyspepsia in the armed forces have stressed the fact that the majority of cases of chronic organic dyspepsia have been men who in civilian life were able to carry on at work and to remain reasonably fit in spite of the presence of a peptic ulcer. As Rook(1943) has pointed out, comparatively few appear to become chronic invalids despite the large number of men and women who suffer from peptic ulceration, and most manage to carry on, some probably settling in sheltered occupations.

The general recommendations with regard to the establishment of the scheme were as follows:-

(a) The men should be employed on shore and harbour service only, under conditions which would not involve hardship or great physical exertion.

(b) The men should be employed as far as possible in the work to which they were accustomed by virtue of their training and experience, and should be employed if feasible, as a group.

(c)/

(c) Self-contained living and messing accommodation should be available at the selected bases, in order that the men could be provided for as a group.

(d) Special victualling and messing facilities should be provided, with provision for snacks of a special kind, for example, milk and biscuits, between the main meals.

(e) The appointment of a qualified dietitian to be considered and trained cooks to be appointed to supervise the diet.

(f) The men should be under regular medical supervision and for this purpose, a part-time medical officer should be appointed who would be responsible for the local supervision of the scheme, general supervision over the scheme as a whole being exercised by a more senior medical officer or consultant.

(g) Spare hands, say ten per cent, should be borne in the establishment in order to permit a man who showed signs of recurrence of symptoms to be placed on the sick list at once, for a few days if necessary.

(h) A hospital centre should be available for the final grading and rehabilitation of cases considered suitable for employment in the scheme, the cases being carefully selected and confined to those with proved peptic ulcer, of high morale and with a good prognosis.

Once these conditions had been attained, it was considered that the men should be fit to undertake any ordinary/

ordinary routine duties provided these did not interfere with the regularity of their meals and snacks.

Finally, it was considered that the place selected for the establishment of the unit should have adequate general hospital facilities in the vicinity in order that any complications or relapses might be dealt with promptly. This would obviously present no difficulty as such facilities were already available in most ports of any size in the United Kingdom.

While these proposals were being considered, a number of naval bases in the United Kingdom were surveyed with a view to choosing the most suitable for the experiment, the site having to a certain extent to depend on the requirements with regard to both available work and suitable accommodation. It was eventually decided to provide, in the first instance, accommodation and work for fifty selected ratings at the Northern Irish ports of Londonderry and Belfast. In the meantime, on the instructions of the Medical Director General, beds were set aside at the Royal Naval Auxiliary Hospital, Barrow Gurney, for the reception of suitable cases, and in April 1944 such cases began to be admitted for final selection and rehabilitation.

PRELIMINARY SELECTION AND NUMBER OF MEN AVAILABLE FOR THE SCHEME.

Investigation showed that in 1942, a total of 829 cases of peptic ulcer had been invalided from the principal Royal Naval Hospitals in the United Kingdom.

No/

No difficulty was therefore anticipated in obtaining a sufficient number of suitable cases for the experiment and in March 1944 authorization was obtained for the transfer to the Royal Naval Auxiliary Hospital, Barrow Gurney, of all cases considered to be suitable for the scheme. The hospitals concerned were requested to report the names of all cases who were thought to be suitable and who had been treated in hospital and retained in the service within the previous six months, so that they might be traced through their depots as required. In this way a total of 147 cases was notified between March and October 1944. The large number of cases notified within such a relatively short period made it impossible, with the number of beds available, to admit more than a proportion for final selection and rehabilitation. It has to be noted also, that in selecting suitable men, consideration had to be given not only to their medical condition but also to the possibility of employing each man in his own particular category as a trained rating. In practice, it was found helpful and time-saving for the Senior Medical Officer in charge of the scheme to visit the depots where large numbers of dyspeptics were congregated in the special diet messes which had been established there as a temporary measure. Such visits made it possible /

possible to pick out a number of men who were suitable both with regard to their medical condition and their non-substantive rating.

HOSPITAL CENTRE FOR FINAL SELECTION AND REHABILITATION.

The Medical Director General directed - "To ensure uniformity,.....it is proposed that preliminary selection of cases be undertaken at R.N. and R.N. Auxiliary Hospitals, and that prior to drafting to the special base or bases, all cases will be centralised to a single hospital (Royal Naval Auxiliary Hospital, Barrow Gurney) where final selection and any necessary treatment and rehabilitation will be carried out." In this hospital, the complete upper floor of one of the buildings was allocated for the reception of cases. This floor consisted of three wards, G1, G2 and G3, the second of which (G2) contained ten beds and was used for the treatment of patients with active ulceration. The largest ward, G1, was equipped with twelve double tiered bunks and was used for the accommodation of all fresh cases on admission, and also as a general dining room (Appendix, Plate I). The remaining ward, G3, by the use of double tiered bunks was equipped to accommodate twenty-two cases and was reserved for men finally selected and passed as fit for duty in the scheme after rehabilitation.

In/

In the final selection of men for employment under the scheme, four factors were considered to be of primary importance. These were -

(1) Only definite proved cases of peptic ulcer should be retained.

(2) The men should be of average or superior intelligence.

(3) They should be of good morale and willing to continue serving.

(4) They should be useful to the service and able to be employed for the most part on care and maintenance work as skilled technical ratings.

These factors will now be considered in further detail.

Evidence of peptic ulcer: In most cases the patients were accompanied by the results of investigations carried out in other hospitals, including clinical notes and X-rays, but in every case a new history sheet was completed in detail, the questions being standardised and the answers tabulated to ensure uniformity and facilitate reference. Where investigations were incomplete or the evidence was doubtful, further investigations were carried out, including barium X-Ray series, fractional test meals and tests for occult blood in the stools. In a number of cases the history of a recent perforation or haemorrhage provided/

provided confirmatory evidence of ulceration, otherwise no case was accepted who had not shown, within the previous six months, evidence of peptic ulcer as revealed by:- (a) History and clinical findings - typical pain, showing relationship to food or hunger, with food and alkali relief; remissions: night pain: loss of weight: positive occult blood in the stools while on a haemoglobin free diet: hyperchlorhydria: history of perforation or haemorrhage.

(b) The presence of an ulcer crater on radiological examination. In those cases in which it was difficult or not possible to demonstrate an actual ulcer crater, other criteria had to be taken into account, as follows:-

(1) Localised spasm leading usually to an incisura opposite the ulcer, and sometimes associated with generalised spasm of the duodenal cap.

(2) Localised pain (not to be confused with discomfort in the abdominal wall caused by the prodding finger); pain is caused in the presence of an ulcer by pressure of the examining finger, probably because tension is increased in the oedematous tissue surrounding it.

(3) Persistent localiised deformity from cicatricial changes in the first part of the duodenum; to be distinguished from deformities caused either by adhesions or by the pressure of viscera or tumours.

(4)/

(4) Disturbances of gastric motility - i.e., hyper-peristalsis with spasm of the duodenal cap in the early stages of ulceration, or delayed emptying in the later stages.

One of these signs alone was not considered diagnostic of ulcer, but their combination was held to be strong presumptive evidence in favour of the presence of ulceration. The above criteria of radiological diagnosis are essentially the same as those described by Allison and Thomas (1941a) and were strictly applied to all cases who were X-rayed or re-Xrayed in the hospital centre. As already indicated, the diagnosis made in other hospitals was accepted where the evidence appeared to be unequivocal.

Average or superior intelligence: The need for intelligent cooperation on the part of the men is obvious. This factor has also been stressed by Rook (1943) who stated that to make a success of such a scheme the men chosen would have to be psychologically of the best type, for it is doubtful if any amount of special dieting or medical supervision will offset the foolishness of a man who will not look after his own health. In the assessment of this factor, the aid of the Neuropsychiatric section of the hospital was obtained in carrying out intelligence tests in the first series of fifty cases in order to sample the types/

types coming forward for employment in the scheme. Generally speaking, the results indicated that the majority of the men were well above the average level of intelligence of a control group of unselected ratings.

Morale: The "will to serve" was more difficult to assess and was closely allied to the intelligence and personality of the individual rating. The problem had thus to be approached individually and separated from the purely physical problem of whether a peptic ulcer was present or not. Details of the personal history of each patient were taken with particular reference to neurotic and psychopathic traits; evidence of emotional instability; obsessive or paranoid tendencies; food fads; family "stomach consciousness"; school record; work record before entering the service; delinquency; service record in relation to reaction to discipline and service life generally, as well as effect of responsibility and seagoing; domestic circumstances; family or financial difficulties. If such a history revealed any doubtful features, the opinion of one of the Neuropsychiatric Specialists might be obtained, but in practice this was rarely necessary as such cases were usually rejected at once.

Value/

Value to the service: This was perhaps the factor which caused least difficulty as it depended upon such definite facts as length of service, non-substantive rating (i.e., "trade"), specialised training and the local requirements at the bases selected for the experiment. The latter gave rise to no difficulty as there was a constant demand for all types of skilled ratings especially in the technical branches. In addition, as the scheme was to be as far as possible, self-supporting, there was also a demand for a number of general service ratings for routine barrack-room duties.

Final Selection: When the investigations and full history had been completed, the cases were brought before a selection board consisting of the Medical Specialist, the Surgical Specialist, the Radiologist and the Medical Officer in charge of the cases. No case was finally selected for the scheme without the full approval of this board, thus ensuring uniformity in diagnosis and standard of selection. In selecting ratings, no distinction was made between long service men and temporary or "hostilities only" categories, although the possible effects of employment in the scheme, upon promotion prospects and the service careers of long service ratings were borne in mind.

Reasons for rejection: To summarise, the reasons for rejection or non-selection of cases were:-

(a)/

(a) Doubtful or equivocal evidence of peptic ulcer, such cases included nervous dyspepsias and all other non-ulcer dyspepsias.

(b) Psychoneurotic and psychopathic types, dullards and mental defectives, hysterics and anxiety states.

(c) Men of low morale, including malingerers, men with unsatisfactory service records, histories of delinquency and any who appeared anxious to avoid further active service.

(d) Men whose value to the service was doubtful but who did not fall into either category (b) or (c). This group included ratings who reported sick during their preliminary training as recruits, men with lengthy records of sickness and ratings in redundant categories. The last mentioned only became a difficulty after the scheme was fully established when owing to the limited accommodation, it was possible to absorb only a very few additional cases. Had it been possible to establish the project on a much larger scale, there would have been little difficulty in employing suitable ratings of any category.

It can be readily appreciated how the issues and management of the scheme might have become complicated had types (a), (b) and (c) not been rejected at the outset. Thus as far as possible, men were selected in whom the physical diagnosis, intelligence, tempera-

ment/

temperament and morale were in harmony and on an equal level, within the limits of normal individual variation. A balance had therefore to be maintained between these different factors in making the final selection. A case might, for example, show evidence of peptic ulceration, appear to be of high morale and good intelligence, express his keenness to continue serving, and be of great value to the service, but might at the same time have a latent psychopathic trait sufficient to make him quite unsuitable for retention in the scheme. This is very well illustrated by the following case.

Case 49: Petty Officer Cook (O), aged 40. First reported sick on account of dyspepsia early in 1944. His symptoms continued on and off for three or four months and he was admitted to a Royal Naval Hospital where a pyloric ulcer was diagnosed. After a period of treatment he was referred to R.N.A.H., Barrow Gurney as a suitable case for the "peptic ulcer scheme". Xray examination was now repeated and apart from some pylorospasm, there was no evidence of active ulceration. He had two years service as a "hostilities only" rating and had a satisfactory record, had reached the rank of Petty Officer and was a first class cook, having been a chef in civilian life. He was admitted to the scheme and joined the special diet mess at Londonderry where he was employed as the chief cook for the mess. He remained well for about two months and then began to complain of minor dyspeptic symptoms and at the same time, he became irritable and depressed and also lost some weight. This coincided with feelings of discontent and mild resentment over the fact that he was not being employed in his proper capacity as an officer's cook. (In this connection, it is of interest to note that on joining the special diet mess he was given the choice of becoming cook to the mess or of being employed as cook to the Captain of the R.N. Barracks, and stated that he would prefer the former.) He also complained that the men had been grumbling about/

about the food and he felt that any such criticism was directed against himself. There was nothing to substantiate this complaint and after a lengthy interview with the medical officer he felt reassured and soon settled down again. Four or five weeks later, however, he again became unhappy and depressed and requested to be relieved of his duties in the special diet galley. This was granted and he was then placed in charge of the galley of the Wardroom Officers' Mess and was now employed in his proper capacity. He appeared to settle down very well and his work was carried out, as it had always been, in an extremely efficient manner. For the next two months he appeared to be very happy and made no complaints but he thereafter gradually became depressed, lost weight and complained of a return of his dyspepsia. He at first denied any worry or feelings of depression but eventually declared that he was "fed up with everything" and that people were talking about him and trying to "get at him". He was referred to the Neuropsychiatric specialist who considered that he had definite paranoid tendencies which might readily develop into a full paranoid state. This in fact did occur a few days later and he was admitted to hospital where observation confirmed the diagnosis and he was invalided from the service. Investigations carried out at the same time showed no evidence of peptic ulcer on radiological examination and a review of the original X-rays obtained from the hospital to which he was first admitted, threw some doubt on the original diagnosis of a pyloric ulcer.

This case has been described in some detail as it shows the necessity of making a correct diagnosis and an adequate assessment of the personality of the patient before considering him suitable for admission to a regime, the success of which must depend largely on the stability of the individuals selected. It is clear that an error of judgment was made in selecting this man for employment in the scheme, and in retrospect, the fact that his services as a cook were so desirable for the good of the special diet mess as a whole, was allowed to be the deciding factor in his case.

Examination/

Examination of his original case sheets reveals that his symptoms were not typical of peptic ulcer and the diagnosis was based on an inconclusive radiological report following a history of dyspepsia of only three months duration. Furthermore, a more minute study of his personal history would have revealed the fact that although he was a first class chef in civilian life, he reacted to difficulties by changing his job frequently and seldom remained longer than one year with the same employer. He also had a history of occasional bouts of heavy drinking when he would suddenly give up his job and go away for two or three weeks without letting his family know where he was going. The experience of this case served to emphasize the importance of maintaining strict criteria in the selection of cases for employment under the scheme if difficulties of management and disposal were to be avoided. The inference upon which such care in selection is based, is that an individual suffering from a peptic ulcer, who has a stable personality and is of good average or superior intelligence, if granted proper facilities, should remain well.

ANALYSIS OF THE WORK OF THE SELECTION BOARD.

Between April and October 1944, 110 patients were admitted to the gastric unit of the R.N. Auxiliary Hospital, Barrow Gurney for final grading and selection. Most/

Most of these cases had been referred as suitable for the scheme on the recommendations of the medical specialists of the principal home hospitals. How satisfactory was this form of preliminary selection is shown by the fact that only 41 of the men were rejected as unsuitable for the scheme and over ninety per cent of those finally selected remained in the scheme until it was terminated at the end of the war. A summary of the cases disposed of by the selection board is shown in Table II.

TABLE II.

Number of cases notified by R.N. Hospitals as suitable for employment in the scheme	147
Number of cases admitted to R.N.A.H., Barrow Gurney for final selection	110
Number of cases invalided as unsuitable for the scheme and permanently unfit for service	13
Returned to duty as fit for general service (insufficient evidence of ulcer)	24
Still requiring further treatment for active ulceration	4
Total	41

The remaining 69 men were accepted for employment in the scheme and from a therapeutic point of view they fell broadly into two groups. The majority of cases came into the category of those who had already been given an adequate period of treatment in other hospitals and whose ulcers had clinically healed.

The/

The smaller group consisted of those who required further convalescence or medical treatment before undergoing rehabilitation prior to active participation in the scheme.

TREATMENT OF CASES OF ACTIVE ULCER.

Cases with evidence of active ulceration as shown by the continued presence of symptoms related to food, night pain, recent haemorrhage, loss of weight, with or without radiological evidence of an ulcer crater, were admitted to the treatment ward where rest in bed was maintained for four to six weeks. The details of the regime employed have been fully described by Allison (1945a) and followed the accepted principles of ensuring as far as possible, complete rest for body and mind.

Dietetic treatment: The dietetic scheme which was followed took into account the need for rest of the stomach, the correction of any existing deficiencies and the supply of sufficient calories to satisfy the bodily needs and to increase the body weight. In the initial stages, two hourly liquid or semi-solid feeds were given, the quantity and variety of food then being increased gradually so that by the end of the fourth or fifth week, providing there was no return of symptoms, a well balanced and more or less normal diet/

diet was being taken, with small milk feeds between the main meals. The preparation of the meals and the choice of foodstuffs were such as to ensure that the diet remained bland and non-irritating even when it had been restored to normal proportions. For the first ten to fourteen days, that is, until an intermediate diet was reached, the vitamin content of the diet was supplemented by the administration of 50 mgms. of ascorbic acid daily. In practice, it was found convenient to use three standard diets which could be readily constituted from available supplies in wartime. Copies of the diets are shown in the appendix together with the "modified normal diet" or "full gastric diet" which was advised on discharge from hospital.

To summarise, the requirements of any diet which is to be used in the treatment of peptic ulcer, at whatever stage the disease may be, must be considered under the following headings:-

(1) To reduce gastric secretion.
(2) To reduce gastric movements.
(3) To avoid gastric irritants.
(4) To increase body weight.
(5) To maintain water balance.
(6) To prevent and correct deficiencies.
(7) Restoration of the diet to normal.

It was a common finding in the Royal Navy, as in the other services, that cases of peptic ulcer were grossly under weight, this being frequently due to voluntary dietary restrictions. In the treatment of such/

such cases, therefore, great stress was placed on the necessity of restoring the body weight as nearly as possible to the average for the age and height of the patient before discharging him from hospital.

Drugs in treatment: The drug which was invaluable in the treatment of all cases was phenobarbitone, this usually being given in half grain or one grain doses night and morning or thrice daily when considered necessary. Tincture of belladonna was sometimes used when there was evidence of pylorospasm and appeared to relieve such cases. A standard mixture of five minims of the tincture in one drachm of water was made up; the commencing dose was one drachm of this mixture thrice daily, the total daily dose then being increased by one drachm per day until the patient was receiving, by the tenth day, four drachms thrice daily. The course was generally continued until the fourteenth day and was thereafter decreased by one drachm daily. Symptoms of intolerance were rarely encountered when this method of increasing dosage was employed. The value of this drug in the treatment of peptic ulcer has been reviewed recently by Douthwaite (1947).

Alkalis in treatment: Alkalis were not used in routine treatment but were sometimes given for symptomatic relief , simple kaolin powder or magnesium trisilicate generally being prescribed. The effects of different alkalis/

alkalis in relieving dyspeptic symptoms have been studied by Allison and Thomas (1941c) who found that kaolin was just as effective in the majority of cases as any of the other more commonly used alkaline powders.

As already indicated, rest was maintained for a period of four to six weeks before the patients were allowed up. Their activities were then gradually increased, provided that there was clinical evidence of healing of the ulcer as shown by the absence of symptoms, and evidence of steady gain in weight. In two or three weeks they were re-Xrayed and if this proved satisfactory, they were transferred to the rehabilitation ward.

REHABILITATION OF CASES SELECTED FOR EMPLOYMENT IN THE SCHEME.

This regime consisted in increasing the variety and the quantity of the foodstuffs eaten, in providing work of an interesting character and in stimulating cooperation on the part of the men by means of a series of group talks or informal lectures. The subjects dealt with included the elementary physiology and psychology of digestion; known exciting causes of peptic ulcer and the types of individual susceptible; the inadequacy of patent medicines and self-medication; the special problems connected with dyspepsia in wartime and in the Royal Navy; the recognition of malingerers; the/

the present prospects of securing dietetic facilities for genuine cases of ulcer, and the need for intelligent cooperation. The role of tobacco and alcohol in the causation and aggravation of peptic ulcer was also discussed but no strict ban was placed on either, the consumption of these items being left to the discretion of the individual. It should be mentioned however that smoking was forbidden during the period of strict hospital treatment.

The occupational therapist attached to the hospital undertook the duty of arranging a suitable programme of work for the men who were undergoing rehabilitation. This was rendered comparatively easy by the fact that the occupational therapy department was in the same building as the gastric unit. Handicraft work was provided in the department, in the form of carpentry, woodturning, French polishing, boot repairing, weaving and plastic work. In addition, an extensive programme of outdoor work was arranged. The ground near the block was laid out as a garden and the patients carried out the complete work of digging, preparing the soil and laying out flower beds and planting a large area with a variety of vegetables (Appendix, Plate II). In addition to the organised programme during working hours, the majority of the men carried on handicraft work in the wards in the evenings.

During the period of rehabilitation, the playing of organised games was encouraged and a successful cricket team was also formed. In addition, ordinary shore leave was granted and naval uniform, not hospital clothing, was worn. A daily routine was drawn up and discipline was maintained on broad principles similar to that of any ordinary naval mess. No difficulties of a disciplinary nature were encountered during the earlier months of the scheme while there appeared to be a reasonable chance of early employment for the men. Later on, however, following the opening of the special diet messes at Londonderry and Belfast, the unavoidable retention of about twenty men for whom accommodation and suitable work could not be found immediately, led to the appearance of some not unnatural discontent which must, in such cases, inevitably lead to deterioration in morale unless an early outlet is provided. This experience clearly showed that hospitalization and rehabilitation should not be prolonged beyond the point where the men have become fit to work under almost normal conditions.

THE ESTABLISHMENT OF SPECIAL DIET MESSES AT LONDONDERRY AND BELFAST.

As already mentioned, Northern Ireland was eventually chosen as the location of the gastric units and facilities were made available at the Naval Bases of Londonderry/

Londonderry and Belfast. Although local conditions differed widely at the two places, they will be considered together, separate descriptions being given only where it is necessary to show points of contrast.

The first thirty ratings were transferred from the Royal Naval Auxiliary Hospital, Barrow Gurney, to the Royal Naval Barracks, Londonderry, on 23rd June, 1944. The number was increased later to 34 and on 27th September, 1944 the Belfast mess was established with the transfer of 16 cases from Barrow Gurney, and was increased to 36 two months later. All these men had had previous medical treatment in Barrow Gurney and other hospitals, were free of symptoms and had completed the graduated course of dietetic and physical rehabilitation already outlined.

Accommodation: At the Royal Naval Barracks, Londonderry, a detached two storeyed block ("Blake") was allocated as living quarters for the men. This building contained a fully equipped galley and it was originally estimated that forty to fifty men could be accommodated and victualled in the mess. When the rooms were finally allocated as separate dormitories and messes for Chief Petty Officers and Petty Officers, and for junior ratings, however, it was found that 35 was the maximum number which could be accommodated in comfort. The main/

main features of the building are illustrated in Plates III to VI in the Appendix. At Belfast, in contrast to Londonderry, there was no establishment comparable to the R.N. Barracks and most of the naval personnel who were employed in the base lived in billets ashore, and were granted lodging and provision allowance. As there were no quarters ashore which would be suitable for the special diet mess, the possibility was considered of utilising the accommodation on board a ship in the harbour. The ship which was eventually used, at the suggestion of the Flag Officer-in-Charge, Northern Ireland, was H.M.S. "Goodson", an American-built frigate which was then berthed adjacent to the Royal Naval Maintenance Base. This ship had been reduced to a care and maintenance basis and was manned by a party of fit personnel who could be released for service in sea-going ships if replaced by ratings with healed peptic ulcers. The vessel contained all the amenities and accommodation for a full sea-going complement of about 120 men and as the care and maintenance party contained little more than a third of this number, there was no lack of suitable living space for either senior or junior ratings, the original arrangement of messes being utilised as far as possible. The first 16 peptic ulcer cases to join H.M.S. "Goodson" only replaced part of the original care and maintenance party of the

ship/

ship and it was thus necessary to retain on board those of the original complement for whom replacements were not immediately available. Arrangements were made for the remaining part of the ship's company (i.e. all fit men) to be victualled on the same diet as the dyspeptic ratings until such time as they could be replaced. A further batch of cases was transferred from Barrow Gurney in December 1944 and the total number of peptic ulcer ratings employed was eventually 36. It was found necessary, however, to retain a certain number of non-ulcer ratings on board throughout the whole period of the experiment, as well as the three officers who were in charge of the ship and who were also victualled on the same diet. The first principle of providing for the peptic ulcer cases as a separate group was thus violated from the start in the formation of the Belfast mess. The arrangement did not however give rise to any difficulties and simplified the victualling problem to a considerable extent as it enabled all the food to be cooked in one galley and thus economised in personnel. The non-ulcer officers and men did not of course receive the extra milk ration for consumption between the main meals.

Victualling and Cooking Arrangements: All the men in both Belfast and Londonderry were on a full and adequate diet, the general rules governing the choice of/

of foodstuffs following closely the recommendations of the Ministries of Food and Health (1943). Strict attention was directed to the following points:-

(a) Meals were taken regularly at intervals of not more than three hours. To allow for this, snacks of bread and butter or biscuits and milk were provided for consumption between the main meals and at bed-time. It was convenient for ratings working in the R.N. Barracks or on board their own ship to return to the mess for their supplementary feeds, otherwise the food was carried to the place of work and consumed during "stand easy", the milk being carried in an eight ounce medicine bottle.

(b)All vegetables and fruits were sieved after cooking and stringy, coarse fibred vegetables, and fruits containing pips or seeds were avoided or suitably prepared before consumption.

(c) The use of condiments and highly seasoned foods was discouraged and the latter were not included on the menu.

(d) New bread, pastry and fried foods were avoided. Extra supplies of milk, eggs, fish, offal, rabbit and fowl were provided whenever obtainable and as far as possible, ordinary meat was consumed not more than once daily. The milk supply was particularly satisfactory as it was unrationed in Northern Ireland and local/

local supplies were plentiful. A minimum requirement of 1½ pints of milk per man daily was recommended, but in actual practice, the average consumption was nearly 2½ pints per man. This made it possible to provide milk soups and abundant milk puddings as well as half a pint of milk for each snack between the main meals. It also enabled a man with a recurrence of symptoms to be placed on a milk diet for a few days if necessary, without actually being placed on the sick list.

A common complaint of dyspeptics in the services was that food was badly cooked and too heavy and greasy. This complaint was probably justified in many instances as in cooking for large numbers, often with limited facilities, it was sometimes necessary to prepare and cook the food a considerable time before it was due to be consumed. Strict supervision was therefore paid to the preparation and cooking of the food for the peptic ulcer cases. All meals were freshly prepared in the galley of "Blake" or "Goodson" and the cooking had to be completed not more than twenty minutes before the meal was due to be consumed. The cooperation of the executive authorities was obtained in ensuring that the men were allowed off duty promptly in order that they would not be late for meals. In no case did this interfere with the work of the departments in which the ratings were employed. One or two individuals occasion-

ally/

occasionally showed a tendency to be late for meals but investigation showed that this was generally the fault of the men themselves and was not due to any lack of cooperation on the part of the departments concerned. When it was necessary for any rating to work overtime or during the night, for example, when urgent repairs were being effected on operational ships, arrangements were made to ensure that light meals or snacks were available at the correct times. While the actual items of the diet depended to a large extent on the supplies which were available, attention was paid as far as possible to the avoidance of monotony and as varied a menu as practicable was provided. Several sample menus selected at random are shown in the appendix and the following is a typical example:-

"BLAKE" MESS MENU FOR WEEK ENDING SATURDAY 16TH DECEMBER, 1944.

Day.	Breakfast.	Dinner.	Tea.	Supper.
Sunday 10th	Shredded Wheat Boiled egg Marmalade Bread & Butter Tea	Clear Soup Roast Beef Creamed Potatoes Brussels Sprouts Plums & Custard	Bread & Butter Cake	Boiled Ham Creamed Potatoes Tea
Monday 11th	Porridge Scrambled Eggs on Toast Bread & Marg. Tea	Chicken Broth Roast Chicken Creamed Potatoes Carrots Rice Pudding	Bread & Margarine Scones	Ox Hearts Mashed Potatoes Ovaltine
Tuesday 12th	Cereal Ox Tongue Marmalade Bread & Butter Tea	Onion Soup Brown Stew Sieved Cabbage Creamed Potatoes Trifle	Bread & Butter Jam Roll	Poached Egg Mashed Potatoes Tea
Wednesday 13th	Porridge Fresh Whiting Marmalade Bread & Butter Tea	Julienne Soup Braised Rabbit Sieved Cabbage Stewed Apples & Custard	Bread & Marg. Buns	Saute Kidney Creamed Potatoes Tea
Thursday 14th	Shredded Wheat Poached Egg on Toast Bread and Butter Tea	Pea Soup Steamed Fish Creamed Potatoes Sieved Turnips Sago Pudding	Bread & Butter Buns	Stewed Steak Mashed Potatoes Horlicks
Friday 15th	Porridge Boiled Egg Marmalade Bread & Marg. Tea	Oxtail Soup Roast Beef Creamed Potatoes Sieved Cabbage Mixed Fruit & Custard	Bread & Marg. Cake	Steamed Fish Creamed Potatoes Tea
Saturday 16th	Cereal Boiled Ham Bread & Marg. Tea	Gravy Soup Steamed Fish Creamed Potatoes Minced Peas Sponge Pudding & Syrup Sauce.	Bread & Marg. Scones	Mutton Chops Mashed Potatoes Ovaltine

Cooks: When the scheme was first proposed, it was recommended that a trained dietician should be appointed to supervise the diet but it was not found possible to put this into effect, and in any case, subsequent experience showed that it was unnecessary. In order to fit in with the general watchkeeping routine of the R.N. Barracks it was necessary for three cook ratings to be detailed for duty in the special diet galley at Londonderry, although in practice there was insufficient for work this number. The most junior and inexperienced rating however, was also employed on additional duties in the main galley of the Barracks. This was an obvious waste of personnel, especially as it was desirable to make the scheme as self-contained as possible. It was later possible to obtain the services of an experienced cook, a chef in civilian life, who was himself a dyspeptic and who became a member of the special diet mess. This released one of the other cooks but unfortunately the arrangement lasted for only a few months on account of the dyspeptic cook developing psychotic symptoms which necessitated his discharge from the scheme, as already described (Case 49). By the time the Belfast mess was established, two cook ratings with healed peptic ulcers were available and fit for employment in the scheme and were trained in the dietetic requirements while undergoing rehabilitation in Barrow Gurney.

An/

An additional cook of the original care and maintenance party was retained on board H.M.S. "Goodson" to make up the required complement for watchkeeping duties. The original ideal of having self-contained cooking arrangements was thus almost realised in the latter case, and if the Belfast and Londonderry messes could have been combined into one establishment, the three cooks with peptic ulcers would have made the scheme self-supporting. The employment of cooks suffering from peptic ulcer had a number of advantages quite apart from the fact that they, being themselves former patients, were better able to appreciate the necessity for adequate preparation and cooking of the diet. It was also convenient to give them detailed instruction on dietetic cookery while they were undergoing rehabilitation in the hospital centre. Not the least of the advantages was the fact that they were exempt from the sudden and sometimes frequent drafting to which the ordinary rating was subject in wartime. This did in fact occur on one occasion in the case of the non-ulcer cooks, and unless a guarantee, virtually impossible under war conditions, could have been given that no cooks would be drafted at short notice, the employment of ordinary cook ratings presented a distinct disadvantage. This becomes more obvious when it is realised that most of the cook ratings available for such duties were usually young and inexperienced, having often only just completed/

completed their training. To have employed more senior and experienced men would have been uneconomical unless it had been possible to expand the scheme or to have employed the cooks on additional duties. The latter arrangement might, on the other hand, have led to a deterioration in the standards which were regarded as essential for the preparation of the diet.

Additional Messing Costs: It is obvious that the extra milk and other foodstuffs required for a relatively small number of men would increase the cost per man compared with the average cost of general messing. The average extra cost over the whole period of the experiment was tenpence per head per day over the standard figure for general messing. It was estimated that a reduction of 3 or 4 per cent would be possible if two to three hundred men were being catered for. Although no precise figures are available for comparison, there is little doubt that it was much more economical to provide special dietetic facilities than it would have been if the men had been granted lodging and provision allowance and left to provide for themselves.

Meals Consumed in the Special Diet Messes While every encouragement was given to the men to take all their meals in the mess at the correct times, there was no compulsion with regard to feeding when off duty and they were as free to take meals ashore as the ratings/

ratings of the general mess. The difficulty of preventing the irregular consumption of meals ashore has already been referred to in connection with the special diet messes in the manning depots where it was found over a test period of time that only 54 per cent of the meals provided in the gastric messes were being consumed. This figure could not have been due entirely to men having their homes nearby as only a small proportion were in this fortunate position, and in any case such men generally preferred to live ashore on lodging and provision allowance. In the Belfast and Londonderry establishments, a careful daily check was kept of the number of meals consumed by each rating and a survey of these records has revealed that 93 per cent of the meals available were consumed in the special diet messes over the whole period of the scheme. This figure provides a high testimony to the excellence of the fare which was supplied and proof that the additional rations were not wasted.

Tobacco and Alcohol: The use and abuse of tobacco and alcohol were discussed with the patients during the period of rehabilitation but once they were fit for duty no active steps were taken to curtail the use of these items other than the warning of their possible adverse effects upon peptic ulceration. Consequently, the/

the men were free to draw their official issue of rum and tobacco if they so desired, this being recorded in each case. Enquiries were also made regarding the consumption of alcohol when on shore leave or long leave. In most cases the word of the man himself was considered to be sufficiently reliable in this respect but there was occasional evidence of excessive drinking in a few individual cases. The relation of these factors to the recurrence of symptoms is discussed in a later section.

Work Available for the Men With Healed Peptic Ulcers: The Londonderry Base was a very busy one and played a major part in the Battle of the Atlantic, being the main operational base for the Western Approaches Escort Force and the Headquarters of the Commodore (D), Western Approaches. Consequently, a large maintenance and repair organisation had to be maintained in order to deal with the requirements of a large number of small ships, in addition to the establishment of a "pool" or manning depot for the supply of replacements for the ships of the Escort Force. The chief demand was for ratings of the engineroom branch (Stokers and Engine-room Artificers) for employment in the dockyard workshops and on repair work on board ships. The communications branches also required a large number of personnel although in many instances this type of work could be carried/

carried out equally well by ratings of the W.R.N.S. In the seamen's branch (non-technical) employment was available on general and regulating duties as most departments had to be maintained with a minimum of staff on account of the requirements of the Escort Force. One or two ratings were also required for routine maintenance duties in the special diet mess itself. There was thus ample opportunity for the employment of men with healed peptic ulcers to supplement the existing complement of the base without fear of their being employed on casual or makeshift work as had tended to be the case in the special diet messes in the main manning depots which have already been described.

It was therefore easy to absorb the first batch of ratings at the outset of the experiment and the executive authorities, after expressing doubts as to the potential usefulness of men whom they seemed to expect would be semi-invalids" with rows of milk bottle tops in lieu of medals", (to quote one comment made before the start of the experiment), were soon favourably impressed by the quality of the work performed. At the commencement of the scheme it was intended that a report on the work of the men should be submitted to the Admiralty after a trial period of two months and the administrative authorities were asked to comment upon the possibility of ultimately replacing/

replacing men on the full complement of the base by ratings with healed ulcers, and thus enabling more fit men to be released for duties at sea or overseas. It was estimated that if this were carried out, it might be necessary to carry ten to fifteen per cent over the normal complement to allow for any increased liability to sickness on the part of the ulcer cases. The working capacity of the men may perhaps best be gauged from the following comment which was made by the Naval Officer-in-Charge in his report on the working of the scheme:- "Generally, it is considered that these men have proved of higher standard than the average* "H.O." rating , and that they can be most usefully employed in the shore staffs of any base working regular hours, where the necessary diet and treatment can be provided. They have proved to be far more efficient than the elderly pensioners at present of necessity generally allowed at shore bases."

At Belfast , most of the shipbuilding and repair work was carried by the civilian contractors who owned the dockyard and there was less opportunity of employing skilled ratings than at Londonderry where the dockyard workshops were manned by naval personnel. There was however, a large administrative organisation under the Flag Officer-in-Charge, Northern Ireland, while as well/

* H.O. = Hostilities Only.

well as ships under construction and repair, there were in the harbour a number of vessels which had been reduced to a care and maintenance basis or were utilised as accommodation ships for personnel in transit through the port. When H.M.S. "Goodson" became available, it was decided to replace the care and maintenance party with peptic ulcer ratings in the first instance, and at a later date to add technical and other specialised categories who could be employed on instructional and other duties in the Escort Force Base. The work on board the ship itself was that of any normal care and maintenance party, namely, painting and cleaning ship, provisioning, boat work and maintenance of machinery and electrical installations. Twenty of the men were eventually on this work and the remaining sixteen were employed ashore in the engineering, signalling and radar departments. The ratings employed ashore sometimes worked a considerable distance from the ship and consequently care had to be taken to see that they were able to get off duty promptly in order to return at the correct times for their meals. Reports on these men showed that they created a favourable impression and they were stated to have worked well and willingly. Those who were employed on board ship carried out a full day's work and worked the same hours and routine as the non-ulcer ratings who were retained in the ship's company. The Commanding Officer reported that

in/

in every case normal harbour duties were performed as efficiently as they were by fit men. It is of particular importance to note that all men of the seamen's branch took part in regular watchkeeping duties in their turn with the non-ulcer ratings. A slight adjustment in meal hours was necessary for the watchkeepers, care being taken to ensure that they did not miss their extra feeds, and no ill effects were observed which might be attributed to the hours of work in these cases. Experience in most of the Royal Naval Hospitals had shown that amongst dyspeptics, symptoms were frequently attributed to irregular meals and watchkeeping duties were invariably cited as the cause of the irregularity. A typical example of such irregularity would be that a man who was due for the afternoon watch would have his dinner at 1130, while the man whom he was relieving would feed at 1230 or 1245, and similarly with the other main meals. As this occurred throughout the period of watchkeeping and as a single watch lasted for no more than four hours, it was obviously a "regular irregularity" and was not accepted as a reason for missing meals since every ship had adequate arrangements for ensuring that the watch below was fed. Under operational conditions however, it was often necessary for a whole ship's company to be at "action stations" for prolonged periods but even in these circumstances meals of some kind were available/

available at regular intervals since nobody was further than half the ship's length from the galley. The average naval rating was thus much better off in this respect when at action stations than his counterpart in the Army or the Royal Air Force. Watchkeeping duties are naturally less popular than other duties and this element of discontent may have been a reason for the tendency to blame the conditions and hours of work for the occurrence of dyspepsia, and therefore might be regarded as psychological rather than mechanical or physical. A much more potent reason, but one which was seldom, if ever, complained of, might be the exposure to cold and damp which watchkeeping duties at sea frequently entailed.

The conditions under which most of the men worked in the Belfast scheme are thus seen to have approximated much more closely to normal service conditions than any of the schemes for dyspeptic cases which were in operation at the Home Manning Depots or even compared with the conditions at Londonderry. As already noted, no difficulties arose through the victualling of dyspeptic and non-dyspeptic ratings on the same food or through their living in the same ship. A full analysis of the work record of the men at both Londonderry and Belfast will be shown in a later section when the final results of the experiment are considered.

Recreation/

Recreation and Maintenance of Morale: At Londonderry the members of the special diet mess were able to make use of the general facilities for recreation and entertainment which were available in the port, the Royal Naval Barracks being particularly fortunate in this respect. In addition, every opportunity was taken to encourage the men to employ their spare time in handicraft work or other forms of occupational therapy, the facilities for which were provided by the Port Education Officer. Continuation of the enthusiasm shown by the football team which had been formed while the men were undergoing rehabilitation was also encouraged with the help of the Physical and Recreational Training Officer and a number of games were played during the winter months.

The Belfast mess, on the other hand, was less favourably placed with regard to recreational facilities but this was to some extent compensated by the fact that the ship's company formed a much more compact community than at Londonderry where the mess was only one of many sub-units within a large organisation. It was therefore possible to obtain many of the amenities available to small ships, through the Port Amenities Officer. A library of about two hundred books was acquired and the ship had its own canteen committee for the administration and organisation of recreational activities.

The/

The ratings thus had a greater voice in their own welfare than at Londonderry where the mess, in common with the general messes, had only one representative on the canteen committee of the R.N. Barracks. The latter situation occasionally led to a feeling amongst the men that they were neglected and that the best of the amenities went to the other messes. This was not a disadvantage however, as it served to convince them of the fact that their mess was regarded in the same way as any other mess in the establishment and not as a "Sick Mess". Occupational therapy was also carried on in the Belfast group and in addition, the Port Education Officer made regular visits to the ship and gave talks on current affairs and other topics. A marked improvement in the recreational facilities was made early in 1945 by the acquisition of a cinema projector for the ship.

The maintenance of morale was regarded as an important essential in the handling of these men and as already shown, special attention was paid to this factor in selecting cases for the scheme. Of primary importance in maintaining morale, as in the case of all serving personnel, was the granting of regular periods of leave. The arrangements for leave were the same as for all naval ratings serving in Northern Ireland, namely, ten days leave every four months if service conditions/

conditions permitted. The choice of Ulster for the establishment of the scheme was at first a cause of mild discontent amongst a few of the men as when most of them were accepted for employment in the special diet units, it was expected that they would be employed in England. The travel restrictions to and from Northern Ireland, together with the curtailment of all service leave on account of the invasion of Europe in June 1944, caused the transfer of the scheme to be regarded at first by a minority of ratings, as almost in the nature of foreign service. It was not long however before most of the men settled down and became quite contented and it is of interest to note that 23 ratings of the Londonderry group expressed the desire to remain there in the event of the scheme being continued permanently. From time to time, when travelling conditions permitted, some of the married ratings asked permission to have their wives and families over for a short period and to live ashore during these visits. Such requests were granted with the proviso that meals should continue to be eaten in the mess as far as possible. This usually meant that the evening meal was eaten ashore but no adverse effects ever resulted from this arrangement.

Medical Supervision: The Medical Officers exercised general supervision over the welfare of the men and maintained/

maintained a close liaison with their Executive Officer, the Victualling Supply Officer and the heads of the various departments in which they were employed. The writer was in charge of the Londonderry group and had the advantage of also being in charge of medical wards in the Royal Naval Auxiliary Hospital, Londonderry, and was thus able to remain in charge of the treatment of any cases who relapsed to the extent of requiring admission to hospital. The Medical Officer at Belfast was employed in the Sick Bay of the Naval Base and had to discharge hospital cases to the Royal Naval Sick Quarters, or to the 24th General Hospital, Belfast.

All ratings were seen by the Medical Officer at least once weekly, usually at a time which did not interfere with the daily working routine. At this interview, which occupied only a few minutes for each case, the weight was recorded together with any symptoms of dyspepsia and any necessary treatment was prescribed. The men also had the opportunity of discussing any problems of a personal nature or any difficulties connected with their working and living conditions. From the psychological point of view, this interview was of the greatest value as a means of "letting off steam" and in this way many minor problems were settled which might otherwise have led to latent discontent or frustration had they been suppressed and allowed to smoulder in the active mind of the more obsessional type of man. It was thus possible to deal with many symptoms/

symptoms almost as soon as they arose and if necessary to prescribe a milk diet for a few days or to stand a man off duty for up to 48 hours without placing him on the official sick list. Should any member of the special diet mess complain of symptoms of dyspepsia at any time other than at the weekly interviews, he was seen by the Medical Officer by arrangement through the senior member of the mess. For all non-dyspeptic complaints the ratings carried out the ordinary naval routine of reporting to the Base Sick Bay with the daily sick parade. They were also subject to the same discipline and routine as the other messes with the exception of the special arrangements for meals and weekly medical interviews.

Treatment of Recurrences of Symptoms: Mild symptoms generally responded to a course of phenobarbitone without requiring any modification in the diet; magnesium trisilicate and tincture of belladonna were also occasionally prescribed if considered necessary. Occasional constipation was treated with liquid paraffin. Where there was a definite relapse of symptoms with no response to these measures, or if there was little improvement after 48 hours in bed on a milk diet, the patient was admitted to hospital or sick quarters for further treatment. If a major complication was suspected the case was of course sent to hospital without/

without any preliminary treatment.

Use of Alkalis: During the period of rehabilitation the uses and abuses of alkalis were discussed and the men who were advised not to take them unless they were essential for the relief of symptoms. It was however recognised, that had the use of alkalis been expressly forbidden or only given under the orders of the Medical Officer, many individuals would have disregarded such orders and would have purchased alkaline powders ashore or from the N.A.A.F.I. which catered for all tastes in proprietary preparations. With a view to avoiding such a situation it was decided to make alkaline powders available "on tap" as it were, in each mess. Two powders were provided, consisting of pulv. kaolin or "Powder A" and pulv. bismuth co. or "Powder B", which could be taken by any rating as and when he wished but he was expected to record the fact when he took a dose of either. The powder records and the meal registers were collected weekly by the Medical Officers and it was found that the records of the amount of alkaline powder taken bore a direct relationship to the incidence of symptoms noted from week to week. The dispensary records of powder issued to the messes provided a double check on the amount consumed and there was little doubt that this arrangement was of value in preventing the indiscrim-

inate/

indiscriminate use of alkalis. One or two individuals who found it necessary to take alkalis fairly regularly liked to have something to take if required when ashore, and for this purpose would occasionally purchase alkaline tablets, "Rennies" being the favourite brand.

General Supervision of the Scheme: Supervision of the scheme in a consultant capacity was carried out by the Consulting Physician to the Western Approaches Command, Surgeon Captain R.S. Allison, R.N.V.R., to whom the medical officers were directly responsible in all matters concerning medical aspects of the experiment. This officer visited the special diet messes at least once every three months when he interviewed the ratings individually and discussed any problems with the executive authorities. The opportunity was also taken during these visits of going round the various departments in which the men were employed in order to inspect the actual working conditions. It was also possible in this way to obtain a more accurate opinion of the value of the ratings from their officers than could be gained from an official written report .

During the period of the experiment, the arrangements in both ports were inspected by the Principal Medical Officer, Western Approaches, the Naval Health Officer, Western Approaches, and the Senior Medical Officer/

Officer, Northern Ireland, all of whom were satisfied with the working of the scheme. The Londonderry mess was also visited by the Commodore (D), Western Approaches who took a keen personal interest in the experiment. These visits did much to make the men feel that they were still contributing to the war effort and that some interest was being taken in their problems.

GENERAL DESCRIPTION AND CLINICAL ANALYSIS OF CASES SELECTED FOR EMPLOYMENT IN THE SCHEME.

Before presenting the results of the experiment a general analysis will be made of the cases selected and employed in the scheme with particular regard to symptomatology, diagnostic criteria and aetiological factors. The figures from both Belfast and Londonderry are considered as one group, the total number employed in the scheme being seventy.

Symptomatology: A clear history of ulcer was given by the majority of the patients, epigastric pain related to the taking of food being the chief presenting symptom. In analysing the symptoms the pain has been classified into four types which were noted as P1, P2, P3, and P4 respectively, and which showed the following features:- P1 = pain occurring at a definite time interval after food; P2 = a continuous ache; P3 = a sharp colicky type of pain; P4 = vague epigastric discomfort. The first type of pain corresponded to the usually accepted characteristic description of peptic ulcer pain and occurred in 48 cases or 68.6 per cent, 10 cases or 14.2 per cent complained of the second type (P2) and 9 cases or 12.9 per cent had never experienced anything more severe than a vague epigastric discomfort (P4). Only one patient gave a history of sharp colicky pain (P3) and this had soon given place to repeated

vague/

vague discomfort. Two cases gave a history of two attacks of haemorrhage between which there was complete freedom from symptoms. Typical remissions of symptoms had occurred in 55 cases or 78.5 per cent; in 6 cases the histories of remissions were doubtful but if these are included, the total number with remissions was 87 per cent of the total and compares with 93 per cent in the series studied by Allison and Thomas (1941a). There was no history of remission in 9 cases but three of these came under observation during the first attack of typical gastro-duodenal dyspepsia, and of the remaining six, five had histories of perforation with a period of freedom from symptoms after operation, but in each case symptoms eventually returned and persisted without further remission until coming under observation. Night pain was a feature in 30 cases or 43 per cent which is almost identical with the findings of Allison and Thomas. Pain was definitely relieved by food in 48 cases, and this corresponded to the number who gave a clear cut history of typical ulcer pain. The pain was relieved by alkalis in 43 cases, many of whom also experienced food relief but a number were relieved by alkalis who were not relieved by the taking of food, the reverse also being true in a few cases.

Other symptoms and complaints: The other most common symptoms were vomiting and loss of weight, the latter was/

was definite in 44 cases (63 per cent), while vomiting was complained of at some time in the history of 38 cases or 54.3 per cent. More detailed enquiries with regard to vomiting revealed that this symptom was present as a prominent feature in 23 cases or 32 per cent of the whole series. In eleven cases it occurred only occasionally or on one or two isolated occasions, while in three cases it was a very early symptom of gastric disturbance but did not recur later in the history. In one case vomiting occurred just before the ulcer perforated. These findings may be compared with those of Love (1943) who noted loss of weight in 53 per cent of cases of all types of dyspepsia in a large series of soldiers, while vomiting occurred in 61 per cent, and was considerable or severe in 31 per cent of all cases.

Other symptoms associated with epigastric pain or discomfort were, flatulence in 51 cases, heartburn (36 cases) and waterbrash (2 cases). Many of the patients who complained of "belching" and flatulence were undoubtedly air swallowers and this feature was observed in 15 cases at the time of the first examination on admission to hospital. Constipation was an established feature in 22 patients, while one man complained of diarrhoea but this was probably due to the excessive use of laxative alkaline powders. Headache was a

definite/

definite complaint in 10 cases, in 8 of whom the history was characteristic of migraine and dated from childhood or adolescence and preceded the onset of ulcer dyspepsia in all cases. One rating had a history of vague "stomach trouble" in childhood while another gave a history of asthma in childhood and adolescence but had no further attacks following the onset of dyspepsia. The association of migraine with symptoms of peptic ulcer in ten per cent of cases was noted by Allison and Thomas (1941) and was thus confirmed in the present series.

Early symptoms: The earliest symptoms of dyspepsia which were experienced consisted of vague discomfort, epigastric fullness, heartburn, flatulence or water-brash in 40 cases, while 32 cases stated that pain was the first symptom, although it is possible that many of the latter might have forgotten earlier episodes of minor symptoms. In 6 cases vomiting was also one of the earliest symptoms and in 3 of these, as already noted above, this symptom did not recur later in the history. Eight cases were completely symptomless until the onset of a complication, 6 having developed perforations while 2 had haematemeses as the first indication of ulceration.

Complications: In all, 36 cases or 51.4 per cent suffered from a major complication at some stage in the history/

history before entry into the scheme, 21 having had perforations while 15 gave a history of haemorrhage. One case had a history of pyloric stenosis secondary to his duodenal ulcer, which was relieved by gastro-enterostomy a few months before his admission to the scheme. Table III shows the relative incidence of complications in relation to the site of the ulcers.

TABLE III.

	Gastric ulcer.	Duodenal ulcer.	Jejunal ulcer	Others.	Total.
Number of cases in series:	14	54	1**	1	70
History of complications:-					
(a) Perforation:	5	16*	-	-	21
(b) Haemorrhage:	4	10	1	-	15
(c) Pyloric stenosis:	-	1	-	-	1

* One case with gastro-enterostomy following perforation.

** Case in whom gastro-enterostomy was performed in childhood on account of stenosis following corrosive poisoning.

Previous operations for dyspeptic symptoms (other than for perforation)

Appendicectomy had been performed in three cases without any subsequent lasting improvement in the symptoms of dyspepsia. Three cases had histories of previous gastro-enterostomy,/

gastro-enterostomy, only one of which had been performed for pyloric stenosis resulting from ulceration (see Table III). In another case the operation was carried out a few months after perforation in 1931 and there is no evidence to show whether pyloric stenosis was present or not but the history suggests that the operation was carried out as a routine measure and not because there was any definite surgical indication or relapse of severe symptoms. The third case with a history of gastro-enterostomy is of particular interest.

Case 62: Leading Cook (O), R.N., aged 26. Drunk some corrosive poison at the age of 2½. This was followed by the development of pyloric stenosis for which a gastro-enterostomy was carried out. He remained well throughout childhood and adolescence and joined the Navy at the age of 18. He experienced prolonged sea service in destroyers during the war and saw a good deal of action in the Mediterranean and in the garrison of Tobruk and he developed symptoms of dyspepsia for the first time during this period of prolonged strain, at the age of 23. The attacks were at first slight and followed by lengthy remissions but the latter became progressively shorter and he also developed night pain. He was still serving in destroyers and was taking part in Russian convoys when in July 1944 he had a severe haematemesis. After he recovered from the acute illness investigations revealed the presence of a jejunal ulcer distal to the stoma of the gastro-jejunostomy. He was considered suitable for employment in the gastric scheme and served as one of the cooks of the Belfast section. He lost no time off duty during the period of observation but was not entirely free from symptoms, which were aggravated by worry. Investigations twelve months after he was first accepted for the scheme still showed the presence of a jejunal ulcer although he was now free of symptoms.

The fact that a peptic ulcer eventually developed in this case twenty years after gastro-enterostomy had been/

been performed for the relief of pyloric obstruction secondary to corrosive poisoning, serves to emphasise the well recognised bad effects of this operation in cases of simple uncomplicated peptic ulcer. It also tends to confirm the belief that the aetiology of peptic ulcer is dependent on factors other than the local conditions in the stomach and duodenum. In this instance the local conditions of abnormal acidity were present in the jejunum from the age of 2½ but ulceration did not occur until other factors came into operation many years later and it seems reasonable to suppose that the period of prolonged mental and physical stress experienced by this rating may have been the event which determined the onset of ulceration, the site of which was decided by the local conditions prevailing at the time in stomach, duodenum and jejunum. It would also appear reasonable to speculate whether this patient might have developed a duodenal ulcer had he been fortunate enough to have escaped from the poisoning accident of his early years. Interest in the natural history of this case has been further stimulated by the recent report by Edwards (1946) of an identical case of pyloric stenosis in a child of 2½ after swallowing corrosive poison, gastro-enterostomy also being necessary in this instance. This child would thus appear to be a candidate for the development of a jejunal ulcer/

ulcer at some future date, given the additional aetiological factors which seem to be necessary to the onset of ulceration. In a recent review of the subject of gastro-jejunal ulceration Lowdon (1947) quotes a case from the literature, in which a jejunal ulcer developed in an infant within a few months of a gastro-enterostomy which was performed for the relief of congenital pyloric stenosis. When jejunal ulceration occurs however, the interval between its recognition and the preceding operation is generally much longer than this but very much shorter than in the case described above.

Results of Investigations in Cases Accepted for the Scheme.

Radiological findings: The diagnoses of the 70 cases selected for employment in the scheme have already been shown in Table III and the radiological findings are detailed in Table IV.

TABLE IV./

TABLE IV.

Xray Diagnosis.	Previous Complications. Uncomplicated.	Perforation.	Haemorrhage.	Pyloric Stenosis.	Total.
Gastric Ulcer	4	3	4	-	11
Probable Gastric Ulcer	1	-	-	-	1
Duodenal Ulcer	23	5	6	-	34
Probable Duodenal Ulcer	3	3	4	-	10
Doubtful Duodenal Ulcer	2	-	-	-	2
Jejunal Ulcer	-	-	1	-	1
Inconclusive Xray findings with history of previous complications:-					
(a) Gastric Ulcer	-	1	-	-	1
(b) Duodenal Ulcer	-	7	-	-	7
No Xray Examination; history of recent complications:-					
(a) Gastric Ulcer	-	1	-	-	1
(b) Duodenal Ulcer	-	1	-	1	2
Total.	33	21	15	1	70

The radiological findings were thus considered to give conclusive evidence of the diagnosis in 27 uncomplicated cases or 38.5 per cent of the total, by the demonstration of an ulcer crater at some time during the history. A history of a major complication provided confirmatory evidence of peptic ulcer in 37 cases or 53 per cent, the majority of whom also showed positive radiological appearances. It is seen from Table IV that all but six cases in the whole series had unequivocal evidence of peptic ulceration at some time in the history, either as the result of positive Xray examinations or the occurrence of a major complication, or both. The six remaining uncomplicated cases showed "probable" Xray findings in four instances and "doubtful" results in the other two. These cases were accepted after a full consideration of the histories, clinical findings, Xrays, test meals and occult blood findings, together with the value of the men to the service. The history and radiological findings were the features which were considered to be of the greatest importance in coming to a final conclusion as to whether a case should be accepted for the scheme or not, a typical history and a "probable" Xray report, for example, being accepted as strong presumptive evidence of the presence of ulceration. The subsequent histories of the two cases classed radiologically as "doubtful" however/

however showed that errors of judgment were liable to be made in selecting cases in which the evidence was in any way equivocal. Although it is possible that both of these cases had actually had ulcers which had healed before they came under observation, it became quite clear that insufficient attention had been paid to their psychological aspects which eventually prevented them from fitting into the scheme. One case has already been discussed in detail (Case 49) and the other is described below.

Case 4: Stoker Petty Officer, R.N., aged 33. First began to have dyspepsia in 1938 at the age of 27, after he had served for eight years in the Navy. The early symptoms consisted of flatulence and epigastric fullness after meals and generally lasted for only three or four days and were followed by long intervals of freedom. He first reported sick in November 1942 when serving in the United States and he now complained of a griping pain in the epigastrium which had 'doubled him up' on several occasions. He also complained of epigastric pain after meals which was not relieved by food or alkalis. He was now admitted to the United States Naval Hospital, Philadelphia, where a diagnosis of duodenal ulcer was made and appendicectomy was performed, without any permanent relief of symptoms. After his return to the United Kingdom he again reported sick and was admitted to the R.N. Auxiliary Hospital, Newton Abbot, where the following results were obtained on investigation:- Barium Meal: "Duodenal cap spastic, no definite crater visualized. Possible duodenal ulcer." Test Meal: Normal acidity curve. Stools: Negative for occult blood.
Intelligence: Average.

He was transferred to R.N.A.H., Barrow Gurney on April 1944 and joined the special diet mess at Londonderry in June 1944. He was employed on general engine-room repair work on board ships and in the dockyard and his work record was satisfactory. He did not fit/

fit in well however, to the Chief Petty Officers' and Petty Officers' Mess and was a cause of considerable discontent amongst his messmates, and was considered by them to be a trouble maker and a "sea lawyer". Although he was employed in his proper capacity as a Stoker Petty Officer he continually expressed dissatisfaction with his work. Nevertheless, he was extremely active and took part in many of the sporting activities of the R.N. Barracks, and also continued to smoke at least 20 cigarettes a day and drew his ration of rum, but there was no evidence of any alcoholic excess. There was no history of excessive war strain or enemy action but he had a considerable amount of domestic worry and was contemplating a divorce action. He complained frequently of such symptoms as headaches, giddiness, restlessness at night and moaning in his sleep, while his digestive complaints were not at all typical of peptic ulcer. There wereno definitely abnormal physical signs on examination, apart from obvious aerophagy, and it was considered that he was using his symptoms hysterically to gain his own ends. His weight showed a gain of four pounds while under observation. It was eventually considered that he had probably never had a definite peptic ulcer and as a six weeks' trial had shown that he was quite unsuitable for continued employment in the scheme, he was discharged to hospital for resurvey and was ultimately returned to general service duties.

Gastric Analysis.- Fractional test meals were carried out in 68 cases, attention being directed to the following points:-

(a) Total volume and acidity of fasting contents.

(b) Emptying time of the stomach as shown by starch and charcoal tests.

(c) Degree of neutralisation at the end of the meal.

In assessing the presence of hyperchlorhydria or hypochlorhydria the normal range as suggested by Bennett and Ryle (1921) and the classification of Bell (1922) were/

were used as standards. Hyperchlorhydria, either of a "climbing curve" or "sustained plateau" type, was found in 46 cases or 67.6 per cent of those to whom the test meal was given. The curve was within normal limits in 17 cases or 25 per cent, hypochlorhydria occurred in three cases while two showed achlorhydria. Two of the hypochlorhydric cases had histories of perforated duodenal ulcers (Cases 54 & 65) while the third had a history of haemorrhage on two occasions from a radiologically proved duodenal ulcer (Case 32). One of the individuals with achlorhydria had a previous history of perforated duodenal ulcer with subsequent gastro-enterostomy and the test meal findings were thus not surprising. The second case of apparent achlorhydria was of much greater interest both on account of the previous history and subsequent events:-

Case 67: Stoker Petty Officer, R.N., aged 28. First developed dyspepsia in 1938 about the time of the September crisis. He was then aged 22 and had already been in the Navy for four years. His symptoms cleared up after a few months and he remained free for five years until January, 1944 when he again developed mild dyspeptic symptoms, while on foreign service leave. He did not report sick until April 28th 1944 when he developed a sudden acute pain in the upper abdomen four days after joining a cruiser. He was admitted to a civilian hospital where he was found to have a perforated duodenal ulcer which was sutured. He made a satisfactory recovery and had been symptom free since the operation when he joined the special diet mess in Belfast in December, 1944. A barium meal in November 1944 showed a large deformed duodenal cap, the appearance of which was considered to be the result of surgery; there was no tenderness and no ulcer crater was/

was seen. The stools were negative for occult blood and a fractional test meal showed no free hydrochloric acid but there is unfortunately no record of any histamine test having been carried out. He remained under observation in Northern Ireland until 22nd June, 1945 when he was transferred to the R.N. Hospital, Plymouth for resurvey on the termination of the gastric rehabilitation scheme. During the period of observation he remained completely free of symptoms, was a non-smoker and almost a complete teetotaller, and lost no time off duty. He was employed in the Battle Damage Stores of the Naval Base and had an excellent work record. Preliminary investigations on admission to hospital still showed the absence of free hydrochloric acid but four days after he was admitted, and before a histamine test or a barium meal had been carried out, he developed a sudden severe pain which he described as "worse than when I perforated". He had perforated a second time and at operation a small perforation was found on the anterior surface of the pyloric end of the stomach, which was considered to be 'possibly pre-pyloric but probably pyloric'. The presence of adhesions prevented full exploration.

The earlier history was essentially negative apart from the first attack of dyspepsia in 1938. He had 4½ years service at sea during the war and saw a great deal of action, including the Bismarck sinking, Malta Convoys and Salerno, his ship being hit by glider bombs during the last-named action. He did not have a recurrence of symptoms however until he was on foreign service leave and was faced with the prospects and uncertainty of a new draft. After a short time in R.N. Barracks he was drafted to another sea-going appointment and his ulcer perforated four days later. The second perforation occurred after nearly fourteen months of freedom from symptoms and the only external factor which might be associated with this catastrophe was the uncertainty which once more faced him with regard to his future in the Navy. There was no evidence at any time of any conscious anxiety and he was a stable personality of average intelligence.

The interest in this case lies in the relatively short interval between the two perforations, the complete absence of symptoms between these complications, and the test meal findings. Too much emphasis cannot be placed on the latter however in view of the fact that/

that the findings were not confirmed by the histamine test, but the demonstration of an achlorhydria after an ordinary test meal in two separate hospitals with an interval of eight months between the tests strongly suggests that there was at least a very marked reduction in acidity in this case. This is of particular interest in view of the original diagnosis of a perforated duodenal ulcer, but the second perforation was undoubtedly pyloric or just on the gastric side of the pylorus and had the appearance of a fairly acute ulcer. Although adhesions prevented a further examination of the area at operation it seems reasonable to suppose that the first perforation was probably also on the gastric side of the pyloric sphincter. Detailed notes of the first operation were unfortunately not obtainable, the diagnosis only being entered on the rating's medical history sheet. The extremely low or absent acidity would not be inconsistent with this finding since Hurst (1929) found achlorhydria in 1.9 per cent of a series of cases of gastric ulcer and considered this to be probably always secondary to associated gastritis, it being highly unlikely that the primary acute ulcer, which preceded the chronic ulcer, would develop in a stomach containing no free hydrochloric acid. It is also stated by the same author that complete achlorhydria never occurs in duodenal ulcer. Morley (1946) states that there is a small minority of cases in which a/

a chronic gastric ulcer is associated with the complete absence of hydrochloric acid, even after the injection of histamine, but this does not necessarily mean that there was a complete achlorhydria at the time of the formation of the ulcer. According to Wood (1945), however, it has been stated that peptic ulceration has never been met with in cases of achlorhydria. In the absence of any follow-up of the history of this case following the second perforation, no definite conclusions can be reached regarding the significance, if any, of the test meal findings.

Occult Blood: The stools of 24 cases were examined for occult blood while on a haemoglobin-free diet, and positive results were found in four cases. These findings were in keeping with the fact that the majority of the patients had been under treatment in other hospitals for some time and were in the convalescent stage when examined. Little stress was therefore placed on this investigation in view of the other diagnostic criteria which were employed.

Condition on Examination: Since the rehabilitation centre was largely a "filter" and received cases from most of the Home Naval Hospitals where the majority of the patients had already had a partial or complete course of treatment, their clinical condition at the time when they came under personal observation would not/

not give a very accurate picture of the findings in cases of peptic ulcer at the time of admission to Naval Hospitals in general. This has already been adequately described by Allison and Thomas (1941) and Wade (1942), and the findings recorded on the case sheets of the present series at the time of their first admission to hospital were similar to those of most of the published series in the other services. The most important observation however, from the point of view of assessment of progress and clinical improvement was the body weight, which was recorded weekly. As already noted, loss of weight was one of the commonest symptoms amongst the subjects of peptic ulcer in the service, and occurred in 63 per cent of this series. A study of the body weights at the time of admission to the rehabilitation centre has further shown that no less than 55 cases or 78.5 per cent were under the standard weight for their height and age, and in 28 of these or 40 per cent of the whole series, the deviation was eleven pounds or more. Eight cases had lost over twenty pounds in weight since the onset of symptoms and three of these were more than thirty pounds underweight; the greatest deviation from the standard weight was 36 pounds. The average deviation from the standard weight for the whole series, on admission to the rehabilitation centre was minus 8.8 pounds. The individual variations are shown with other data in Table VIII.

Other Factors.

Duration of Symptoms: The average length of history before entry into the scheme was 4.1 years for gastric ulcer and 6.2 years for duodenal ulcer. Of the 14 cases of gastric ulcer, 10 had histories of less than five years duration and four had had symptoms for five years or more, the longest being eleven years and only one had a history of less than twelve months. In the cases diagnosed as duodenal ulcer, on the other hand, 27 or 50 per cent had symptoms for five years or more and 50 per cent had histories of less than five years duration. Of the latter, more than a third (10 cases) had histories of less than one year, while 15 cases or 27.7 per cent of the total number of cases of duodenal ulcer had symptoms for 10 years or longer, the longest being 20 years, in two cases.

Age at Onset of Symptoms: Most published studies of the war-time picture of peptic ulcer have emphasised the early age of onset of the disease, and the present series proved to be no exception to this finding. The average age of onset was 24.4 years, the youngest being 14 and the eldest 52 years of age. In 62.8 per cent of cases the onset occurred before the age of 25 and only 23 per cent began to have symptoms for the first time after the age of 30. At the time of selection/

selection for employment in the scheme, over 70 per cent were under the age of 34, the majority being under 30. These results are shown in Table V.

TABLE V.

Number of Cases.

AGE GROUP.	AT ONSET OF SYMPTOMS.	AT DATE OF SELECTION.
Under 15	2	-
15 - 19	19	1
20 - 24	23	21
25 - 29	10	11
30 - 34	8	17
35 - 39	6	13
40 - 44	1	5
Over 44	1	2
Total:	70	70

Length of Service at Onset of Symptoms: When the onset of symptoms in relation to the length of service is considered it is found that 36 cases or 51.4 per cent. developed dyspepsia before the war, and of these, 23 were in civilian life at that time and 13 were already in the Navy as regular service ratings. Symptoms developed for the first time during the war in 34 men, 32 of whom were in the Royal Navy at the time/

time of onset of the dyspepsia, 14 of these being regular service ratings, while 18 were "hostilities only" ratings who had no history of symptoms in civil life. Thus 25 cases or 35.7 per cent had symptoms in civil life prior to entering the Navy and the remaining 45 cases or 64.3 per cent were already in the Service when their dyspepsia first began. This is a higher proportion than in most of the published series from British Service sources, all of which have emphasised the fact that the majority of cases of peptic ulcer seen in the Services originally developed symptoms in civil life. The difference is accounted for by the fact that the present series deals with a highly selective group, 44.2 per cent of whom were regular service ratings who entered the Navy at the age of 17 or 18 or even earlier as boys. The experiment was designed with a view to preventing the loss of highly skilled and fully trained ratings and thus long service men were likely to be of more value than the average "hostilities only" rating and an effort was therefore made to retain as many of the former as possible. When the cases are separated into these two main groups it is found that over 50 per cent of the regular service ratings developed their symptoms before the war while the "hostilities only" men were almost equally divided between a pre-war and a wartime onset. These figures are summarised in Table VI.

TABLE VI.

	Onset Pre-war.	Onset During War	Total.
Regular Service Ratings:	*17	14	31
"Hostilities Only" Ratings: **	19	20	39
Total :	36	34	70

* Includes four men who joined as regular service ratings after the beginning of the war.
** Includes pensioners and reservists recalled from civilian life.

No significant inference can be drawn from these figures and they are considered as one group throughout this thesis.

Intelligence: The importance of selecting only men of high morale who were willing to continue serving in spite of the diagnosis of peptic ulcer has already been stressed. Reference has also been made to the satisfactory results of intelligence tests which were carried out in the first fifty cases admitted to the rehabilitation centre for final selection. Experience tended to show that there was a direct relationship between the morale and the intelligence of the patient. Tests were eventually carried out on all cases finally selected for employment in the scheme and it was found that/

that 57 per cent were above average intelligence as shown by the Shipley and Wechsler standards and only 4 per cent were classed as "dull normal". These findings are consistent with the recognised experience that the subject of peptic ulcer is generally an intelligent and conscientious type of individual (Draper et al., 1944). The results are shown below in Table VII.

TABLE VII.

Summary of Results of Intelligence Tests (Shipley & Wechsler).

	No. of Cases.	Percentage of Total.
"Very Superior"	4	5.7
"Superior"	20	28.5
"Bright Normal"	16	23
"Average"	27	38.5
"Dull Normal"	3	4.3
Total:	70	100.0

Personal History and Personality: Psychological Factors:

An attempt was made to assess the personality and any evident adverse psychological factors which might have some bearing upon the natural history of the disease, by a detailed investigation of the personal history/

history and environment in every case who was finally selected for the experiment. The method followed by Allison and Thomas (1941) was employed, using the three main headings of (A) Domestic Life, (B) Service Life and (C) Personality. The results of this investigation are tabulated in detail in Table VIII, together with the assessments of intelligence and morale, the findings being shown separately for gastric and duodenal ulcer. It has also been convenient to include the deviations from the standard weight in this table.

TABLE VIII./

TABLE VIII.

(See Key on page 110)

PERSONAL HISTORY AND PERSONALITY.

(A) GASTRIC ULCERS.

Case	Age	Rating.	Deviation from standard Wt. (lbs)	A. 1	A. 2	A. 3	B. 1	B. 2	B. 3	B. 4	C 1	C 2	C 3	C 4	Intelligence	Morale	Value to R.N.	Remarks
8	43	P.O. Tel. (P)	+1	-	-	-	+	-	-	-	-	-	-	-	Superior	Good	+++	Haem. 1943.
10	20	A.B. (HO)	+7	+	-	-	-	-	-	+	-	+	+	-	Average	Good	+	Perf. 1943, misfit in scheme.
27	43	Ch. Sto. (AS)	-26	-	-	-	+	-	-	+	+	+	-	+	Superior	Good	+++	Emotional factors ++.
28	34	A.B. (HO)	-15	-	-	-	-	-	-	-	+	-	-		Superior	Good	+	Haem. 1943, worry + then.
31	19	Sig. (AS)	+2	-	-	-	-	-	-	-	+	-	-		Average	Good	++	Perf. 1943, frustration+
37	22	E.R.A. (HO)	-5	+	-	-	+	-	-	-	-	-	-	-	Bright normal	Good	++	Perf. 1944, 2 mths. after entry.
38	24	P.O. (AS)	-20	-	-	-	-	-	-	-	-	-	-	-	Bright normal	Good	++	Stable type.
39	27	L/Sea (AS)	-11	-	-	-	-	-	-	-	-	-	-	-	Bright normal	Good	++	Haem. 1944. Accid. killed May 1945
40	21	O.A. (HO)	-1	-	-	-	-	-	-	-	-	-	-	-	Bright normal	Good	+++	Little insight

(A) GASTRIC ULCERS.

Case	Age	Rating.	Deviation from standard Wt. (lbs)	A. 1	A. 2	A. 3	B. 1	B. 2	B. 3	B. 4	C. 1	C. 2	C. 3	C. 4	Intelligence	Morale	Value to R.N.	Remarks
42	38	L/Sea (RFR)	-21	-	-	-	-	+	-	+	+	-	-	-	Very Superior	Excell.	++	Symptoms began after action in "Jervis Bay".
46	36	Sto. P.O. (AS)	-9	-	+	-	-	-	-	+	-	+	-	-	Average	Fair	++	Haem. 1944. Aerophagy +. War stress & domestic worry +++.
50	23	A.B. (HO)	-7	-	-	-	+	-	-	-	-	+	-	+	Average	Good	+	Perf. 1944, after alcohol++
51	23	P.O. M.M. (HO)	-7	+	-	-	-	-	-	-	+	+	-	-	Superior	Good	++	Aerophagy +. Little insight
70	32	Sto. (AS)	Nil.	-	-	-	+	-	-	-	-	+	+	+	Dull normal	Fair	+	Perf. 1944 Alcohol++ ? Mild psychopath.

(B) DUODENAL ULCERS.

Case	Age	Rating.	Deviation from standard Wt.	A. 1	A. 2	A. 3	B. 1	B. 2	B. 3	B. 4	C. 1	C. 2	C. 3	C. 4	Intelligence.	Morale	Value to R.N.	Remarks
1	23	A.B. (HO)	+2	-	-	-	-	+	-	-	-	-	-	-	Dull normal	Fair	+	-
2	46	C.P.O. (P)	-26	-	-	-	+	-	-	-	-	-	-	-	Superior	Good	+++	Perf. & Gastro-enterostomy 1931.
3	37	P.O. (RFR)	-10½	+	+	-	-	-	+	+	-	-	-	-	Superior	Good	+++	Symptoms related to anxiety.
4	33	Sto. P.O. (AS)	+5	-	+	-	-	-	-	-	+	+	-		Average	Good	+	Hysterical prolongation of symptoms.
5	30	Coder (HO)	-8	-	-	-	-	-	-	-	+	+	-	-	Very Superior	Good	+	-
6	40	A.B. (RFR)	-3	+	-	-	-	-	-	-	+	-	+		Superior	Good	++	Perf.1943 following bad news.
7	32	Sto. P.O. (AS)	-15	+	-	-	+	-	-	-	-	-	-	-	Bright normal	Good	++	Perf. 1943.
9	27	Sto. (HO)	-22	-	-	-	-	-	-	+	-	+	-	+	Superior	Good	++	Perf.1943 as 1st symprom.
11	36	Std. (HO)	-33	+	-	-	+	-	-	-	-	-	-	+	Superior	Good	+	Perf.1943 as 1st symptom after Russian Convoy.
12	34	L/Sea (AS)	-10	-	-	-	+	+	-	+	-	+	-	-	Average	Fair	+	-

(B) DUODENAL ULCERS.

Case	Age	Rating.	Deviation from standard Wt.	A. 1	A. 2	A. 3	B. 1	B. 2	B. 3	B. 4	C. 1	C. 2	C. 3	C. 4	Intelligence.	Morale	Value to R.N.	Remarks.
13	42	E.R.A. (RNR)	+10	+	-	-	+	+	-	-	+	+	-	+	Average	Fair	+++	Emotional factors +
14	37	L/Sea (AS)	-36	-	-	-	-	-	-	-	-	-	-	-	Bright normal	Good	++	Haems. 1943 &1944
15	35	A.B. (HO)	-14	-	-	-	+	-	-	-	-	-	-	+	Bright normal	Good	+	?Hysterical prolongation of symptoms
16	29	E.A. (AS)	-5	-	-	-	-	-	-	-	-	-	-	-	Bright normal	Good	+++	Marked pyloro-spasm
17	29	Sto. P.O. (AS)	-8	-	-	-	-	-	-	+	-	-	-	+	Average	Good	++	Alcohol++
18	38	A.B. (HO)	-23	+	-	-	-	-	-	+	-	+	-	-	Average	Good	+	Perf.1944 no remission since.
19	22	L/Sea (HO)	-9	+	-	-	-	-	-	-	-	-	-	-	Dull normal	Good	+	Appendicectomy 1945, D.U. seen at operation.
20	28	A.B. (HO)	-8	-	-	-	-	-	-	-	-	-	-	-	Bright normal	Good	++	No insight re tobacco & alcohol.
21	30	Sig. (HO)	-12	-	-	-	-	-	-	-	-	-	-	-	Superior	Good	+	Haem.1943.
22	28	Std. (HO)	-15	-	-	-	-	-	-	-	-	-	-	-	Average	Good	+	No insight.
23	33	L/ Coder (HO)	-1	-	-	-	+	-	-	-	-	-	-	-	Very superior	Excell.	++	Perf.1943 as 1st symptom.

(B) DUODENAL ULCERS.

Case	Age	Rating.	Deviation from standard Wt.	A. 1	A. 2	A. 3	B. 1	B. 2	B. 3	B. 4	C. 1	C. 2	C. 3	C. 4	Intelligence.	Morale	Value to R.N.	Remarks.
24	37	L/Sig (AS)	-10	-	-	-	-	+	-	-	-	+	-	-	Bright normal	Excell.	++	Perf.1934, then free for 3 yrs.
25	31	Sto. P.O. (AS)	+4	-	-	-	-	-	-	-	-	+	-	+	Superior	Fair	++	Alcohol++ Unsatisfactory type.
26	21	L/Sig (AS)	-9	+	-	-	-	-	-	-	-	+	-	+	Superior	Excell.	++	Sensitive type, little insight.
29	23	L/Sto. (HO)	-12	-	-	-	-	-	-	-	+	-	-	-	Superior	Excell.	++	Stable type.
30	20	A.B. (HO)	-2	+	-	-	-	-	-	-	-	-	-	-	Superior	Excell.	++	Haems. 1943 & 1944 as only symptomd.
32	38	Sto. (HO)	-3	-	-	-	-	-	-	-	-	-	-	-	Average	Excell.	+	Haems. 1942 & 1944 as 1st symptoms.
33	28	E.R.A. (AS)	-1	-	-	-	-	-	-	-	+	-	-	+	Superior	Good	+++	Gloomy type
34	21	E.R.M.4 (HO)	-15	-	-	-	-	-	-	-	-	-	-	-	Average	Good	+++	Asthma in childhood no obvious psychogenic cause.
35	22	L/Sea (AS)	-5	-	-	-	-	-	-	-	-	-	-	+	Average	Good	++	No insight
36	32	Sto. (AS)	-16	-	-	-	+	-	-	+	-	-	-	-	Superior	Good	++	Stable type.

(B) DUODENAL ULCERS.

Case	Age	Rating.	Deviation from standard Wt.	A. 1	A. 2	A. 3	B. 1	B. 2	B. 3	B. 4	C. 1	C. 2	C. 3	C. 4	Intelligence.	Morale	Value to R.N.	Remarks.
41	36	A.B. (HO)	+2	-	-	-	-	-	-	-	+	-	-	-	Superior	Good	+	Haems. 1943 and 1944. Easily upset emotionally.
43	38	C.P.O. (AS)	-12	-	-	-	-	-	-	-	+	-	-	-	Average	Good	++	Stable type.
44	24	Sto. P.O. (AS)	-12	-	-	-	-	-	-	-	-	-	-	-	Average	Good	++	Perf. 1943.
45	34	A.B. (HO)	-21	-	-	-	-	-	-	-	-	-	-	-	Bright normal	Fair	+	Perfs. 1944 & 1945.
47	32	L/Sea (AS)	-35	-	-	-	-	+	-	-	-	+	-	-	Superior	Good	++	Perf. 1944 Stable type.
48	20	A.B. (HO)	+5	-	-	-	-	-	-	-	-	-	-	-	Average	Fair	+	Symptoms worse after D-day. Appendicectomy in 1943.
49	40	P.O. Ck. (HO)	-14	-	-	-	-	-	-	-	+	+	+	+	Bright normal	Good	++	Unstable personality paranoid.
52	26	A.B. (HO)	+3	-	-	-	-	+	-	+	+	-	-	-	Average	Good	+	Little insight.
53	21	P.O. (HO)	+15	-	-	-	+	+	-	+	-	-	-	-	Average	Good	++	Gastro-entero-stomy 1944 for pyl.sten.
54	32	Sto. P.O. (AS)	-17	-	-	-	+	-	-	+	-	-	-	-	Superior	Good	++	Perf. 1944.
55	24	A.B. (AS)	-6	-	-	-	+	-	-	-	-	+	-	-	Superior	Good	++	Little insight.

(B) DUODENAL ULCERS.

Case	Age	Rating.	Deviation from standard Wt.	A. 1	A. 2	A. 3	B. 1	B. 2	B. 3	B. 4	C. 1	C. 2	C. 3	C. 4	Intelligence.	Morale	Value to R.N.	Remarks.
56	32	E.R.A. (HO)	-8	+	-	-	+	+	-	-	+	-	-	+	Very Superior	Good	++	Haems. 1939 and 1943. Migraine history.
57	53	Sto. (HO)	-16	-	-	-	-	-	-	-	-	-	-	-	Average	Good	+	Short history but no evidence of carcinoma.
58	36	A.B. (AS)	-10	+	-	-	-	-	-	-	-	-	-	-	Average	Good	+	Perf.1943.
59	30	P.O. Ck. (AS)	-15	-	-	-	+	-	-	-	-	+	-	-	Average	Fair	+	Haems.(2) 1944.
60	26	E.R.A. (AS)	-9	+	-	-	+	-	-	-	-	+	+	+	Average	Fair	++	Perf.1944 2/52 after father died. Unstable history.
61	21	A.B. (AS)	+2	-	-	-	+	-	-	-	-	-	-	-	Bright normal	Good	+	Haem.1944. Almost no previous symptoms.
63	21	L/Rad Mech.	-14	+	-	-	+	+	-	-	-	-	-	-	Average	Fair	+	Unstable family history.
64	22	A.B. (HO)	-5	-	-	-	+	-	-	-	-	+	+	+	Bright normal	Good	+	Neuropathic traits as a child. ?Mild psychopath.
65	21	A.B. (HO)	-12	-	-	-	+	+	-	-	-	-	-	-	Average	Good	+	Perf.1944 after 2 days dyspepsia.

(B) DUODENAL ULCERS.

Case	Age	Rating.	Deviation from standard Wt.	A. 1	A. 2	A. 3	B. 1	B. 2	B. 3	B. 4	C. 1	C. 2	C. 3	C. 4	Intelligence.	Morale	Value to R.N.	Remarks.
66	32	S.A. (HO)	-1	-	-	-	-	+	-	-	+	+	+	+	Average	Good	+	Haems.1939 & 1944. Invalided from Army 1939. Joined R.N. 1943. Psychol. factors ++
67	28	Sto. P.O. (AS)	-14	-	-	-	-	-	-	-	-	-	-	-	Average	Good	++	Perf.1944 & perf. in RNH 1945.
68	37	Ch. Sto. (AS)	-18	-	-	-	+	-	-	-	+	+	-	-	Average	Fair	++	Haem.1944 Action ++
69	30	P.O. (AS)	+1	+	-	-	+	-	-	+	-	+	-	-	Bright normal	Good	++	Action ++

(C) JEJUNAL ULCER.

Case	Age	Rating.	Deviation from standard Wt.	A. 1	A. 2	A. 3	B. 1	B. 2	B. 3	B. 4	C. 1	C. 2	C. 3	C. 4	Intelligence.	Morale	Value to R.N.	Remarks
62	26	L/Ck. (AS)	-22	+	-	-	+	-	-	-	+	+	-	+	Bright normal	Fair	+	Haem.1944. Gastro-entero-stomy at age 2½ following Corrosive poisoning. Unstable type. Alcohol + .

Key to Table VIII. (Columns 5, 6 & 7.)

A. Domestic Life:-
1. Anxiety over illness of relative, worry over family problems.
2. Unhappy marital relations.
3. Financial difficulties.

B. Service Life:-
1. Duties; lack of experience, special difficulties, dislike of the service, extra responsibility, boredom or monotony.
2. Seasickness.
3. Lack of Sleep.
4. Anxiety following actual war experiences.

C. Personality:-
1. Overconscientiousness, worry over trifles.
2. Ambition, frustration, resentment, insecurity.
3. Adaptability, obsessive tendencies, intolerance of interference.
4. Swings of mood, depression, excessive work.

Column 3:-
P = Pensioner.
AS = Active Service i.e. regular service rating.
HO = Hostilities Only (includes both conscripts and volunteers).
RFR = Royal Fleet Reserve i.e. men who have formerly served on a twelve years engagement and recalled for war service.

TABLE VIIIA.

Summary of Psychological and Personal Factors shown in Table VIII.

Group	No. of Cases.	Frequency of Factors (see Key to Table VIII). A. 1	A. 2	A. 3	B. 1	B. 2	B. 3	B. 4	C. 1	C. 2	C. 3	C. 4	None of Above Factors Present. No. of Cases.
Gastric Ulcer	11	3	1	0	5	1	0	4	3	8	2	3	3
Duodenal Ulcer	43	14	2	0	18	13	1	9	12	19	5	15	12
Jejunal Ulcer	1	1	0	0	1	0	0	0	1	1	0	1	0
Total	55	19	3	0	25	16	4	17	17	30	10	23	15

It is thus seen that none of the factors enumerated were present in the histories of 15 cases or 21.4 per cent of the series. The order of frequency of the different factors in the remaining 55 cases is shown in Table IX. The most commonly found features were feelings of frustration, usually associated with insecurity and resentment. The latter feeling was also closely associated with service problems which formed the second largest group of personal and environmental factors. This group included definite dislike of the service as well as difficulties in accepting extra responsibility, boredom, and monotony of life at sea. The importance of monotony and boredom in precipitating psychosomatic symptoms has been previously noted in a study of the incidence of such symptoms amongst the personnel of a sea-going ship (Rae, 1940) when it was found that Sick Bay attendances were much greater during periods of comparative inactivity at sea. Swings of mood, depression, anxiety over family problems or following war experiences were also comparatively common, while obsessional tendencies and lack of adaptability were less common features.

TABLE IX.

Order of Frequency of Personal and Psychological Factors in 55 Cases.

	No. of Cases.
1. Frustration, resentment, insecurity, ambition.	30
2. Duties; special difficulties, dislike of the service, extra responsibility, lack of experience, boredom or monotony.	25
3. Swings of mood, depression, excessive work.	23
4. Anxiety over family problems (including illness of near relatives)	19
5. (a) Anxiety following actual war experiences.	17
(b) Overconscientiousness, worry over trifles.	17
6. Seasickness.	16
7. Obsessive tendencies, lack of adaptability, intolerance of interference	10
8. Lack of sleep	4
9. Unhappy marital relations	3
10. Financial difficulties	0

It is important to note that in many cases these factors might not be evident in an ordinary superficial history and examination, and were often only elicited on taking a more minute personal history. This applied particularly to the cases in whom only one or two isolated features were present. When however, several of the above factors were present in the same/

same patient, there was a much greater chance of finding manifest evidence of a psychogenic disturbance. Such cases often appeared to be in an intermediate state between apparent purely organic or somatic disease on the one hand, and a psychosomatic illness on the other, and in one case progressed to a definite psychiatric condition. The latter case (Case 49) has already been described in detail and it has been seen that although the original evidence favoured the presence of peptic ulceration, it seems doubtful if an ulcer was ever definitely present and this case should therefore be considered as having been entirely a psychiatric problem from the beginning.

Some aspects of the relationship of peptic ulcer to psychogenic and personality factors are illustrated by the following cases in whom several of the features described above were evident.

Case 13: Engineroom Artificer, R.N.R.(H.O.), aged 43. History of dyspepsia since the age of 27. Entered the Navy in Sept. 1939 at the age of 38. Symptoms were aggravated by severe sea-sickness and pain became more severe in 1943, with typical food relief and relief to a lesser extent from alkalis. Investigated in R.N.A. Hospital, Newton Abbot in November, 1943 when a duodenal ulcer was demonstrated on Xray examination and a test meal showed a very marked hyperchlorhydria. Joined the peptic ulcer employment scheme in June 1944 and remained under observation for 12 months. During this period he carried out the full duties of his rank, working chiefly on board ships which were undergoing repair and carrying out night duties and extra hours ofwork as the occasion demanded. Throughout the period of observation he constantly complained of minor dyspeptic symptoms although he continued to gain weight and lost no time off duty on account of sickness.

He/

admission to the gastric scheme, in August 1944. He was in the scheme in Northern Ireland for nine months and was free of symptoms during the first seven months of this period. He then had a brief return of pain which cleared up after three days rest. Re-investigations in June 1945 still showed a well marked hyperchlorhydria but there was no Xray evidence of active ulceration.

His early history revealed that he had "neurasthenia" at the age of 18 (i.e. two years prior to joining the Navy) and also showed that he had an unstable background with insecurity and frustration as prominent features. At the time of onset of his illness he was greatly worried over his paternity. His acknowledged 'father' had just died and the 'father' whose son he thought he was, could not be traced. He was unsuccessful in his application for leave in order to try and trace his true parentage and to get other family affairs settled, and his hitherto 'silent' duodenal ulcer perforated two weeks later. There was also a history of excessive smoking and drinking before the perforation. Observation over a period of nine months showed him to be a sensitive, rather unstable personality but he gave satisfactory service as long as he was helped and encouraged.

Case 64: Able Seaman, (H.O.), aged 22.

First developed dyspepsia early in 1942, after he had been in the Navy for twelve months, most of this time having been spent at sea in an area of active operations. His earliest symptoms were epigastric pain after food, sometimes accompanied by vomiting. Investigations in hospital in May 1942 revealed a duodenal ulcer and after a period of treatment, he was recommended for twelve months Home Shore Service. He then remained completely free of symptoms and at the end of the twelve months he was passed fit for General Service and joined a sea-going ship. His dyspepsia soon returned however, and he was admitted to a Military Hospital in Vancouver, B.C., in December 1943 when a duodenal ulcer was again found. After treatment he was employed for a few months on shore duties in New York but as his symptoms again recurred, he was discharged to the United Kingdom as a foreign invalid in July 1944. Investigations still showed evidence of a duodenal ulcer with marked hyperchlorhydria. He responded well to medical treatment and rehabilitation and thereafter served in the peptic ulcer employment scheme for nine months, during which time he complained frequently of minor symptoms of dyspepsia/

dyspepsia. Although he was completely free of symptoms for no longer than one month at a time there was no return of severe pain and he lost no time off duty.

The previous history revealed evidence of neuropathic traits in childhood, including enuresis, nail biting and fears of the dark. His mother was an asthmatic, anxious and nervous type of person who died shortly before the patient joined the Navy. His father was a stern parent and a devout church-goer.

Observation showed him to be subject to swings of mood with phases of depression and frustration to which he reacted by taking alcohol, the latter having the effect of making him aggressive and led to disciplinary action being taken against him on one occasion.

The impression given by this case was that of a mildly psychopathic character who was precariously adjusted to his environment but was capable of giving good service if properly handled.

Case 66: Supply Assistant, (H.O.), aged 32.

This man first developed dyspepsia at the age of 18 when he became subject to recurring attacks of burning epigastric pain one hour after meals and relieved by taking more food. He consulted a doctor who advised extraction of his teeth. This was done but it made little difference to the dyspepsia, which continued to recur at intervals of up to six months. He became a bus conductor at the age of 19 and managed to carry on in this occupation until he was called up for service in the Territorial Army in 1939. In October 1939, that is, one month after entering the Army, he had a haematemesis and was invalided from the service as a case of duodenal ulcer, in January 1940. From 1940 to 1943 he worked in the Air Ministry where he had an easy job and was able to live at home and to diet himself. He remained comparatively well during this period although he continued to have recurring attacks of pain. In 1943 he volunteered for service in the Navy and was accepted, as he gave false answers and denied any previous service in the Forces and concealed his history of peptic ulcer. In the Navy, as might have been expected, his symptoms became worse, he began to have attacks of pain during the night and after ten months in a destroyer he developed severe melaena and was admitted to hospital in June 1944 and was later transferred to R.N.A.H., Barrow Gurney for rehabilitation and admission to the peptic ulcer scheme. Re-investigation in November 1944 showed that the ulcer had apparently healed. During the next eight months he remained free of symptoms and lost no time off duty on account of dyspepsia or any other cause. In July 1945 there was no radiological evidence of active ulceration, the presence of aerophagy being the/

the only abnormality demonstrated, apart from some degree of hyperchlorhydria.

His previous history revealed that he was an illegitimate child and had had a good deal of illness in childhood, including treatment in a sanatorium for suspected tuberculosis. There was also a strong family history of tuberculosis. There was thus considerable insecurity from his earliest days and he added to his responsibilities by marrying at the age of 19, eventually having a family of three. He was a tense, anxious and sensitive personality and was unduly sensitive to the opinions of others - "I like everybody to think well of me," - and became depressed when things began to go against him. At other times he would feel quite exalted, such as on the day he joined the Navy, and was apt to act irrationally. There was no evidence of any serious domestic or financial worries.

While there was ample evidence to suggest that psychogenic factors played a large part in the aetiology of this case, he gave the impression of being extremely willing and cooperative, and undoubtedly improved under regular supervision with dietary facilities. It is also to be noted that all the psychogenic features appeared to be constitutional in origin although the complication of haemorrhage occurred in each instance when the external environment was unfavourable.

When the above cases are considered together they are seen to have the following features in common:-

(a) Evidence of the presence of peptic ulceration on radiological investigation or confirmed by the occurrence of a major complication.

(b) Secretory and/or motor abnormality in the stomach and duodenum as shown by Xray and test meal findings.

(c) Well marked personality and psychogenic factors with or without an unstable constitutional background. Although the third group of factors cannot be cited as an invariable or sole cause of peptic ulceration, there is/

is sufficient evidence from the work of Davies and Wilson (1937), Wolf and Wolff (1942; 1943a & b), Weiss and English (1943), and others to emphasise their importance in the aetiology of the disease. The emotions which were found by Wolf and Wolff to be associated with increased secretory and motor gastric function, which persisted during sleep, were those of the more aggressive type including hostility, resentment, anxiety and sustained emotional tension. Table IX shows that similar emotions were common in many cases of the present series. The relationship of these factors to the occurrence of complications and relapses of ulceration will be again discussed in a later section, after the final results of the experiment have been considered.

RESULTS OF THE EXPERIMENT.

Number of Cases Employed and Ultimate Disposal:

As already described, the 70 cases who were employed in the experiment in Northern Ireland were selected for the following reasons:-

(a) All had shown evidence of peptic ulceration.

(b) They were all fully trained and highly skilled men whose services were of value to the Royal Navy, and who were willing to continue serving.

The conditions at the selected Naval Bases were such that a number of essential conditions were fulfilled:-

(a) The men were provided for as a group.

(b) Every man was as far as possible employed in his proper category so that casual or makeshift work was avoided.

(c) A full day's work was carried out and the men were subject to ordinary naval discipline and routine, apart from the special arrangements which were made for their diet and medical supervision.

The majority of the ratings remained in the Special Diet Messes until the scheme was terminated in June, 1945, following the end of hostilities in Europe, when there was no longer the same necessity for retaining the men in the service. All cases were now transferred to the/

the R.N. Hospital, Plymouth, where they were re-investigated under the direction of the Consulting Physician in charge of the scheme. The final disposal of the cases is summarised in Table X which shows that the majority were invalided from the service. This course was carried out as it was considered that most of the men would almost certainly relapse if they returned to the conditions of general service in the Navy. Exceptions were made in three cases who had only to complete a very short time before qualifying for pensions as long service ratings.

TABLE X./

TABLE X.

Final Disposal of Cases.

A. Discharged from the Scheme before its termination.

Reasons for Discharge.	No. of Cases.	Disposal.
Unsuitable	2	General Service
Unsuitable & probable error of diagnosis	1	General Service
Compassionate Reasons	1	General Service
Developed psychotic symptoms	1	Invalided
Died as the result of an accident	1	-
Total	6	

B. Remained until Scheme terminated.

No. of Cases.	Disposal.
61	Invalided
3	Returned to limited general service to complete time for pension.
Total 64	

Duration of Service in the Scheme: The total length of service in the scheme is shown in Table XI, together with the average time spent in the Rehabilitation Centre. In Table XI(A), the figures of twelve, nine and six months respectively date from the opening of the Londonderry Mess on 24th June, 1944, the opening of the Belfast Mess on 27th September, 1944, and the increase of accommodation at Belfast in December, 1944. The remaining ratings were drafted from time to time to take up vacancies which arose through the disposal of the cases who were discharged before the end of the experiment, or when additional men were required for certain branches. It is seen that the time spent by the Belfast cases in the Rehabilitation Centre was unduly prolonged, and the majority of this group served for less than nine months in Northern Ireland. The excessive hold-up in hospital was due to an unavoidable delay in the provision of accommodation at Belfast. It has to be remembered, however, that the time in the hospital centre was spent in active rehabilitation and is thus not comparable to a period of ordinary hospital treatment.

TABLE XI./

TABLE XI.

Duration of Service in the Scheme.

(A) Employment in Northern Ireland:-

Duration.	No. of Cases.
12 months or over	27
9 months	16
6 months	19
3 months	4
Less than 3 months	4
Total	70

	Londonderry Cases.	Belfast Cases.
(B) Average Duration of Stay in the Rehabilitation Centre	62.1 Days.	95.5 Days
(C) Average Duration of Employment in Northern Ireland	312.4 Days.	208 Days

(D) Average Total Stay in the Scheme (all cases) = 336.7 Days.

Work Record of the Men Employed in the Experiment: The type of work available at Belfast and Londonderry has already been described and it has been emphasized that the men were employed in carrying out normal duties and not on makeshift work or 'light duty'. Examples of the nature of the work performed by some of the Londonderry cases are illustrated in the Appendix (Plates VII to XII). Although the men in the Londonderry section were additional to the complement of the Base and did not, in the first instance, replace any fit men in the establishment, most of them carried out duties which would have required extra staff had the cases of healed peptic ulcer not been available. This applied in particular to a Petty Officer who was employed as an instructor in seamanship, and to several ratings of the Engineroom Branch, all of whom were eventually added to the permanent complement.
At Belfast, on the other hand, as already noted, most of the men replaced the members of the ship's company of H.M.S. "Goodson" who had been retained as a care and maintenance party, and thus carried out duties which would have otherwise required the retention of a complement of fit ratings.

Time Off Duty as a Measure of the Value of the Experiment: The value of the experiment to the Royal Navy depended firstly, on whether there could be an appreciable/

appreciable saving of manpower through the creation of favourable conditions for men who would otherwise have been invalided, and secondly, on the reduction of time lost through sickness on account of dyspeptic symptoms. Although only a small scale experiment was carried out, there was sufficient evidence to show the value of retaining such men in the service and an appreciable saving of manpower might well have been accomplished had the scheme been continued on an extended scale. The second question is more difficult to answer accurately in view of the comparatively small number of men involved, the limited duration of the scheme and the difficulty of making a suitable comparison with civilian sickness figures.

An examination of the sickness records reveals that 40 ratings or 57 per cent lost no time off duty on account of dyspepsia, but 11 of these were off duty on account of other causes for a total of 128 days, or 11.63 days per case. Thirty cases or 43 per cent were off duty as the result of recurrent dyspepsia for a total of 674 days, or 22.47 days per case. Twelve cases were on the sick list for 14 days or more and were considered as major relapses and accounted for a total of 559 days of sickness, the average per case being 46.58 days. The remaining 18 cases of relapse were off duty for periods of three to fourteen days and/

and presented a total of 115 days of sickness or an average of 6.39 days per case. Four of the cases who were off duty on account of dyspepsia lost in addition 36 days on account of other causes.

A study of the general sickness figures of the Royal Naval Barracks, Londonderry, during the twelve months in which the peptic ulcer scheme was in operation shows that gastro-duodenal disorders accounted for 15 per cent of all causes of incapacitating sickness. This represents a total of 44 cases who were sick for a total of 1,076 days or an average of 24.45 days per man. These figures include nine cases of the present series who accounted for 473 days of sickness. When the latter are separated from the total, the figures for the general population of the R.N. Barracks show an average time off duty per case of gastro-duodenal disease of 17.2 days. The average incapacity for all causes of sickness in the same period was 15.4 days per case.

No lengthy follow-up of the cases studied has been possible but most of the men were under observation for twelve months or more under conditions of active re-habilitation or normal employment. From the point of view of working capacity the period of rehabilitation will not be considered as the men were still under hospital supervision during this time. The most satisfactory way of expressing the results would appear

to/

to be a consideration of the number of days of incapacity on account of recurrent dyspepsia in relation to the total number of days of employment under normal service conditions. This reveals that the 30 cases of recurrence lost 8.78 per cent of their possible working time on account of the relapse of symptoms of peptic ulceration. Published figures of incapacitating sickness in the insured population of Scotland for the year 1936-37 show that the average incapacity due to gastric and duodenal ulcer was 60.04 days per case, in men under 55; that is, in the same age groups as the cases of the present series. When chronic cases who were sick throughout the whole year were included, the average incapacity per case was 100.95 days, for the same age groups. Table XII summarises these groups of figures and although the incapacity shown in the Scottish sample appears to be much greater than that of the naval group, the numbers in the latter are too small to justify any conclusion on a statistical basis, and the apparent difference, judging from a study of the individual values, would probably be much less in a larger series.

TABLE XII./

TABLE XII.

	No. of Cases.	Total No. of possible working days.	Days of incapacity on account of Peptic Ulcer.	Percentage loss of working time.	Average incapacity per case. (Days)
Men employed in the R.N. Experiment, 1944-45, who were off duty with relapse of symptoms of peptic ulcer.	30	7,687	674	8.78%	22.47
Insured Population of Scotland, 1936-37. Men under 55 incapacitated on account of peptic ulcer (excluding chronic cases).	3,382	1,229,357	203,044	16.52%	60.04
Ditto - all cases in Men under 55.	3,747	1,228,810	378,244	30.71%	100.95

It is seen from Table XIII that the duration of the incapacity was greater in the older age groups in both the R.N. cases and the group of insured persons.

TABLE XIII.

Average Duration in Days of Incapacity due to Peptic Ulcer.

	AGE GROUPS.	
	Under 30.	30 - 50
R.N. Cases	16.47	30.31
Insured Population of Scotland, 1936-37.	61	102

The most complete follow-up with regard to the working capacity of patients with peptic ulcers appears to be that of Bashford and Scott (1935) who studied the subsequent sickness records over periods of three to twenty years, of a series of 430 Post Office workers who had suffered from gastric or duodenal ulcers. While it was evident that many individuals enjoyed subsequent good health, the general expectation of working incapacity in cases of definite proved peptic ulcer, however treated, and under ordinary industrial conditions, was definitely high. Thus 31.6 per cent incurred an average subsequent yearly incapacity for work of more than one month; 27.7 per cent of from 14 to 28 days; 17.7 per cent of from 7 to 14 days and/

and 23 per cent of less than a week, the latter representing the undoubtedly good results from the standpoint of working capacity. A further point of interest was that no support was found for the view that cases of perforation have a better subsequent record than others, and in fact the sickness figures were better in those who had not perforated. In the present series, ten cases of recurrence or one third of the total who relapsed, gave a previous history of perforation, while seven had a history of haemorrhage.

With regard to non-dyspeptic illnesses, it was observed that mild recurrences of dyspepsia were often associated with the presence of upper respiratory infections such as the common cold and sinusitis. This was particularly noticeable during the winter months when the weekly incidence of dyspeptic symptoms showed a definite increase, especially in the older age groups who appeared to be more subject to minor respiratory infections. The relationship between respiratory and other infections and a recurrence of symptoms in the subject of peptic ulceration has of course been long recognised (Moynihan, 1912; Hurst and Stewart, 1929), and the prophylaxis of such conditions should therefore be a feature of any regime for the rehabilitation of cases of peptic ulcer.

In assessing the value of the naval sickness figures/

figures it has to be remembered that the time off duty on account of illness is often longer in service cases than in comparable civilian patients, in view of the high standard of fitness required before a man can return to normal duty. The duration of incapacity shown in Tables XII and XIII for the cases of relapse, may thus be an overestimate of the expected sickness of such cases under a controlled regime. In the more severe relapses, the time off duty included periods of convalescence and sick leave, the latter being also much longer than would normally be possible from an economic standpoint in civilian patients of similar social status. There appears to be little doubt therefore, that the experiment was of value in preventing prolonged sickness in the cases observed, although their expectation of working incapacity was appreciably higher than that of the general population of ratings in the Royal Navy. More serious relapses could also be prevented by the arrangements which enabled a man to be placed on a lighter diet and frequent milk feeds, with or without a short period of rest, whenever his symptoms became more severe. This would sometimes enable a patient to carry on with an important job in spite of his symptoms, as shown by the example described below. Alvarez (1944a) considers that such a course is of value in preventing complications and that frequent/

frequent feeds should be commenced, in anticipation of a possible flare-up of symptoms, whenever a patient who has had an ulcer goes through an emotional crisis.

Case 16: Electrical Artificer, R.N., aged 29. This rating had a history of duodenal ulcer for six years, and during the observation period of over twelve months he had fairly constant symptoms, usually complaining of epigastric pain and vomiting, and latterly showed signs of pylorospasm. In spite of his symptoms h e managed to continue in a most important job and was off duty for only two periods of 48 hours on account of dyspepsia. He obtained considerable relief from gastric lavage which was carried out as an outpatient. On re-investigation, he was found to have, as had been assumed on clinical grounds, an active duodenal ulcer with evidence of pylorospasm. He was a stable personality and showed no obvious psychogenic features but excessive smoking may have been a contributory factor in aggravating his symptoms. There was no history of alcoholic excess and in fact he drank no alcohol of any kind during the period of observation until two weeks before his resurvey, when he began to draw his rum ration for the first time. This was considered to be possibly an effect rather than a cause of his symptoms.

Results of Final Investigations: When the cases were resurveyed in the Royal Naval Hospital, Plymouth, at the end of the experiment it was found that 48 cases or 68.5 per cent of the whole series showed no evidence of active ulceration. Thirty-six of these cases were entirely free of symptoms, 3 still complained of typical gastro-duodenal dyspepsia, while 9 had occasional mild discomfort. Active peptic ulceration was present in 13 cases or 18.5 per cent, 7 of these having typical symptoms, while 5 had only occasional slight discomfort. One rating denied having any symptoms of dyspepsia although/

although a definite ulcer crater was demonstrated radiologically. This case had however, a previous history of two severe haemorrhages but had no other symptoms apart from these complications, and will be described in more detail in a later section (Case 30). One rating whose case has already been described (Case 67) was free of symptoms throughout the period of observation but developed a perforation while awaiting resurvey in hospital. Equivocal findings occurred in two patients, one of whom still had symptoms of gastro-duodenal dyspepsia. The final results, which were based chiefly on the radiological findings, are summarised in Table XIV together with the time lost off duty on account of dyspepsia, and the previous incidence of complications. Six other cases had been previously discharged from the scheme as already indicated in Table X.

TABLE XIV./

TABLE XIV.

Results on Resurvey (64 cases).

	No evidence of active ulcer.	Active ulcer present.	'Doubtful' ulcer present.	Ulcer perforated.	Total.
Total cases.	48	13	2	1	64
Entirely free of symptoms.	36	1	1	1	39
Symptoms still present.	3	7	1	-	11
Occasional mild symptoms.	9	5	-	-	14
No. of cases off duty with dyspepsia.	17	9	2	-	28
Total days of incapacity with dyspepsia.	410	178	72	-	660
Previous complications:					
Perforation	14	4	1	1	20
Haemorrhage	10	4	-	-	14
Pyloric stenosis	1	-	-	-	1
Jejunal ulcer	-	1	-	-	1

Gastric analysis was carried out in 63 cases, the remaining case having perforated before this investigation was commenced, and the results are summarised in Table XV. In addition to the findings in Table XIV, six cases showed well marked aerophagy on Xray examination in the absence of any symptoms of dyspepsia. Mild spasm or hypermotility was also demonstrated in a number of cases who had no evidence of active ulceration.
At the final clinical review of the series, no case was seen in whom gastro-duodenal function was apparently normal in the presence of dyspeptic symptoms. Without exception, the men who still complained of definite symptoms were found to have some abnormality of motor or secretory function on radiological or test meal examination. These findings were considered to provide clear evidence of the exclusion of hysterical cases or malingerers from the series.

TABLE XV.

Results of Gastric Analysis on Resurvey (63 cases).

	No. of Cases.
Hyperchlorhydria	49
"Normal" acid curve	11
Hypochlorhydria	3
Total	63

Benefits of the Regime to the Individual Case:

The benefit of the regime to the individual cases may best be judged by a comparison of the general nutrition and/

and body weight of the men at the beginning with that at the end of the experiment. It has been noted already that 55 cases or 78.5 per cent. were under the standard weight for their age and height at the time of admission to the scheme. Weekly records of the weights of 68 men were available from the date of first observation to the date of final resurvey, and these show that 54 cases or 77.14 per cent. of the whole series had a definite and maintained gain in weight. The average nett gain per patient was 7.29 lbs. and individual increases ranged from 2 or 3 pounds to 28 lbs. Twelve cases showed slight loss of weight compared with the initial values, while two showed no variation. With one exception, all of the patients who were initially below their standard weight showed a definite increase and the average deviation from the standard weight for all patients was minus 3.25 lbs. compared with minus 8.8 lbs. at the beginning of the experiment. On clinical grounds it was clear that the general nutrition of the men had improved under the regime and the majority expressed the desire to remain in the scheme should it be continued by the Admiralty, as they felt that their health had benefitted greatly by the special arrangements made for them. No definite claim can be made however that the improvement in health was due to the regime, in view of the natural tendency of the disease/

disease to show remissions. The absence of any generally accepted criteria with regard to the healing and recurrence of activity in cases of peptic ulceration adds further to the difficulties of assessing the value of the scheme. From the economic standpoint the experiment was on too small a scale to contribute more than a very small part to the saving of manpower, but this was offset by the improvement in the health of the individual and the possible reduction of his pensionable disability when he was finally discharged from the service. There is no doubt that the majority of the cases were less fit at the beginning of the scheme and would then have required a greater percentage of disability than when they were finally invalided at the end of the experiment.

The scheme afforded a unique opportunity of studying the daily progress of cases of peptic ulcer under standard conditions and an attempt has been made to describe the natural history of the disease as observed under these conditions. Attention has been paid particularly to those factors which may influence the recurrence of symptoms, and as the majority of the cases observed were examples of duodenal ulcer, the features outlined in the next section are mainly applicable to that disease.

THE NATURAL COURSE OF THE DISEASE.

The usual textbook account of gastric and duodenal ulcer such as that of Hurst (1946) or Tidy (1945) suggest a fairly stereotyped pattern of symptoms which are also well reviewed by Ryle (1932; 1936). Ogilvie (1944; 1945) has recently stated that duodenal ulcers fall into three types from the clinical standpoint, these being designated duodenal ulcer A, B. and C. respectively. Duodenal ulcer A is the common type or the chronic ulcer with a history of attacks and remissions. Type B is the ulcer which perforates and is stated to be usually seen in a young man with no previous history of dyspepsia or at the most has felt off colour for two or three days, and in Ogilvie's experience, after simple closure, more than half of the cases of this type are never heard of again and leave no ulcer symptoms, nor is the perforation repeated. Ulcer C is characterised by repeated attacks of major haemorrhage and is seen typically in older men. The view that prognosis is better in perforated cases than in any other form of peptic ulcer is also shared by Wakeley (1944) who states that a recurrence of pain or other symptoms is unusual and the patient can live an ordinary life. On the other hand, Bockus (1943) considers that the majority of patients who have been operated/

operated upon for perforation do not remain symptom free and quotes recurrence rates ranging from 64.4 per cent.(Thompson, 1939) to 82.5 per cent. (Harrison and Cooper, 1942). The findings in the recent extensive survey in the West of Scotland by Illingworth, Scott and Jamieson (1946) show that the incidence of major complications within five years of perforation was 20 per cent. and 70 per cent. of cases had relapsed within five years, while 40 per cent. relapsed within one year. Contemporary studies in Newcastle (Houston, 1946) and Middlesex (Forty, 1946) confirm these findings and provide little support for the view that the ulcer which perforates runs a satisfactory course. The West of Scotland workers consider that the remission which commonly follows a perforation is probably due to the rest in bed, the careful diet, the prolonged convalescence, and perhaps the altered mental outlook induced as a result of the operation. That the perforating ulcer is not confined to the patient with no preceding symptoms has been shown by Black (1933) who found that 74 per cent. of an unselected series of perforations had suffered from previous attacks of dyspepsia and 48 per cent had been previously diagnosed as peptic ulcer.

Many of the studies of peptic ulcer in the armed forces have also revealed conflicting points of view with regard to the natural history of the disease and the/

the relationship between symptoms and the presence of active ulceration. Thus Gill, Berridge and Jones (1942) state that the absence of the classical type of remission in the history is significant in distinguishing on clinical grounds ulcer from duodenitis. On the other hand, Love(1943) found that only 50 per cent. of patients with active ulcers had typical remissions, while an exactly similar percentage of men with no radiological signs of ulcer but with similar pain, gave the typical history of remissions. This author concluded that so far as clinical diagnosis is concerned, peptic ulcer can be accompanied by almost any type of dyspeptic pain. In a series of cases presenting typical histories of gastroduodenal dyspepsia, Allison (1943a) found that 39 per cent. showed unequivocal radiological evidence of ulcer, 23 per cent. showed doubtful evidence, and negative Xray findings occurred in 38 per cent. Statistical analysis of the positive and negative groups showed that while typical pain, food relief, night pain, remissions, hyperchlorhydria, under-nutrition and the absence of gross anxiety or depression are valuable in diagnosis and more common in cases with radiological evidence of ulcer, their preponderance in the latter as compared with those showing negative findings, was not as great as might have been expected. Weighing the individual symptoms and plotting the scores graphically showed/

showed that there was considerable overlap of the two groups. It was suggested that these observations lent further support to the view that the ulcer was incidental and not essentially responsible for the symptoms of this common form of dyspepsia.

Clinical Picture: A study of the case histories and the weekly review of symptoms of the present series throughout the course of the experiment, together with the remainder of the 147 cases who were originally notified as suitable for the experiment, has shown that the clinical picture of peptic ulcer in the Royal Navy fell broadly into three groups. The first and most common picture, which may be called the Episodic Type, corresponds with Ulcer A of Ogilvie's classification and consisted of the usually recognised typical history. That is, there are periodic attacks of epigastric pain or discomfort followed by remissions often for lengthy intervals. In this group were also included cases with relatively slight symptoms of what might be termed 'minor dyspepsia' which lasted for only two or three days at a time but recurred after periods of complete remission. The symptoms during an attack might range from the 'typical' ulcer pain after food or interval pain, including night pain, to 'atypical' mild discomfort after meals or between meals. The constant

and/

and most characteristic feature of this group is the remissions, and typical examples are shown in the following case histories:-

Case 1: Able Seaman, (H.O.), aged 23.
This rating first began to have dyspepsia at the age of 14 when his symptoms were associated with nausea and headaches of the migraine type. He entered the Navy in 1941 at the age of 19, and after six months service at sea he developed epigastric pain after food, which was relieved by food and alkalis. Pain also occurred occasionally during the night. The attacks lasted for two or three weeks at a time and were followed by remissions of several months. He was treated in the R.N. Hospital, Simonstown, in May, 1942 and in the R.N. Hospital, Plymouth, and the R.N.A. Hospital, Newton Abbot, from September to December, 1943, when a diagnosis of duodenal ulcer was made. His symptoms relapsed while he was on sick leave in December, 1943 and he was admitted to an E.M.S. Hospital where he was treated for nine weeks. He was subsequently accommodated in the special diet mess of the R.N. Barracks, Devonport, until April, 1944 when he was admitted to the R.N.A. Hospital, Barrow Gurney, for rehabilitation and admission to gastric scheme. Investigation now showed a persistently deformed duodenal cap and although no crater was visualized, the findings were very suggestive of a duodenal ulcer. A test meal revealed hyperchlorhydria. Intelligence - 'dull normal'. After joining the Special Diet Mess at Londonderry on 24th June, 1944, he complained occasionally of epigastric discomfort after food but had no real disability until March 1945 when he developed a sudden attack of acute pain in the epigastrium and was admitted to hospital as a possible perforation. He improved rapidly on medical treatment however, and returned to duty after 41 days on the sick list. He suffered from a recurrence of pain four weeks later whilst on leave and symptoms persisted after his return but he lost no further time off duty. Symptoms were still present when he was resurveyed in June, 1945, and investigations now showed a tender deformed duodenal cap and a high acid curve and he was considered to have an active duodenal ulcer. He gained nine pounds in weight during his stay in the scheme and this was maintained in spite of his recurrent symptoms.

This was a dull young man who admitted to taking alcohol while on leave and this undoubtedly precipitated a/

a relapse of his dyspepsia. He also smoked 15 cigarettes a day and would require close supervision in civilian life if further relapses were to be prevented, the emphasis in this instance being on mechanico-chemical factors.

Case 5. Coder, (H.O.), aged 30. This man first developed dyspepsia at the age of 27, about 18 months after he entered the Navy. For the next 12 months he suffered from intermittent attacks of burning pain in the epigastrium 1½ hours after food, the pain being relieved by food and alkalis. The attacks became more severe and he reported sick for the first time in February, 1943. He attended the Sick Bay at intervals until October, 1943 when he was treated in an E.M.S. Hospital for two weeks but no investigations were carried out and he returned to duty. He again reported sick in December, 1943 and was admitted to the R.N.A. Hospital, Newton Abbot in January, 1944 when investigations revealed a definite duodenal ulcer and hyperchlorhydria. He was discharged to the dietetic mess in the R.N. Barracks, Devonport, on 11th February, 1944 and remained there until he was admitted to the R.N.A. Hospital, Barrow Gurney, for rehabilitation in April, 1944. In view of the recent positive radiological findings, the investigations were not repeated and he joined the Special Diet Mess at Londonderry on 24th June, 1944. He remained very well throughout his stay in Northern Ireland and was not off duty on account of dyspepsia or any other cause. He complained occasionally of heartburn or mild discomfort but was practically symptom free until May, 1945 when he had a mild recurrence of symptoms for three weeks and required alkalis for a short time. This return of symptoms coincided with worry over his wife's forthcoming confinement. He was employed in the Signal Office at Londonderry and also took an active part in the football and cricket activities in the R.N. Barracks. When he was resurveyed in June, 1945 he was free of symptoms and there was now no evidence of active ulceration. His weight showed almost no variation throughout the period of observation and he was just under the average standard weight for his age and height.

He was a conscientious and reliable man of 'very superior' intelligence who responded to difficulties with temporary anxiety and feelings of insecurity. He experienced some enemy bombing before entering the Navy but was never exposed to any excessive strain in the service. He worried readily about his domestic affairs and this usually aggravated his dyspepsia and he smoked to excess when worried. The prognosis was considered to be good provided he could stick to a well ordered regime in civilian life.

Case 8: Petty Officer Telegraphist, (Pensioner), aged 43. This petty officer first developed dyspepsia in 1933 at the age of 32. His symptoms then consisted of discomfort and fullness behind the sternum and loss of appetite, followed soon by the onset of epigastric pain immediately after food, this being relieved by food and alkalis. He first reported sick in 1936 when he was given alkaline powders and dietetic restrictions were advised. He was unable to diet himself but continued to take alkaline powders regularly. He suffered from recurrent attacks of dyspepsia with remissions of several months until December, 1943 when he had a severe haematemesis and was admitted to the R.N.A. Hospital, Seaforth, Liverpool. He responded well to medical treatment and in February, 1944 a barium meal showed the presence of a pre-pyloric ulcer with pylorospasm. Tests for occult blood in the stools were now negative and a test meal showed a normal acidity curve. He was discharged to the dietetic mess in the R.N. Barracks, Devonport, where he remained until he was admitted to the peptic ulcer rehabilitation scheme in April, 1944. He joined the Special Diet Mess at Londonderry on 24th June, 1944 and was subsequently employed as an instructor in anti-submarine warfare. He lost no time off duty but on three or four occasions he complained of slight attacks of epigastric pain between meals, lasting for two or three days at a time. These attacks generally coincided with the presence of a common cold and he was also subject to a good deal of nasal catarrh, but showed no evidence of any gross sinus infection. He continued to smoke 20 cigarettes a day and drank his ration of rum, as well as two or three bottles of stout when ashore. There was a previous history of excessive smoking and moderate drinking and he had never entirely given up these habits since developing a peptic ulcer. He gained 16 lbs. in weight during the period of observation and when resurveyed in June, 1945 there was no evidence of active ulceration.

He was a stable personality of 'superior' intelligence who had served in the Navy for eleven years after first developing a peptic ulcer, and had qualified for his long service pension by the time he was invalided at the end of the experiment. He had no personal or family worries but his duties in the service had always entailed considerable responsibility and his haematemesis followed a period of four years almost continuous service at sea, during which he had taken part in the operations off Holland, Norway, Dunkirk, Oran, Pantellaria and Sicily and he had also survived the sinking of two ships.

The/

The second clinical group or the Continuous Type comprised a much smaller number of cases who were rarely free of symptoms when under regular observation and complained continually of minor dyspepsia such as vague epigastric discomfort, nausea, regurgitation, flatulence or heartburn. This class contained the overconscientious types in whom abnormal personality traits were more common, and also included the 'food faddists', and the regular consumers of alkalis or patent medicines, many of whom displayed mildly obsessional features. Cases in this group are liable to be regarded as neurotic or as examples of nervous or functional dyspepsia although they may be the subjects of undoubted peptic ulceration. The underlying pathological diagnosis is often missed in the absence of a typical history or of any of the major complications of peptic ulcer. This type of patient may continue to complain of minor symptoms even long after all the clinical evidence indicates healing of the ulcer; an example of such a case has already been described (Case 13). The chief problem in this group is the assessment of prognosis and healing of the ulcer since the symptoms provide no criteria of activity. Gill (1947) has recently pointed out the unreliability of pain as an index of healing and his views are supported by the clinical findings in some of the cases of the present series.

Case 12:/

Case 12: Leading Seaman, (R.N.), aged 34.
This rating first developed dyspepsia in 1932 at the age of 22, when he had an attack of retrosternal pain and vomiting after food which was relieved by alkalis and which cleared up after a week. Following this attack, he had occasional mild epigastric discomfort for which he took alkalis from time to time. There was little disability however, until 1942 when he developed more severe epigastric pain after food, which was relieved by foood. These symptoms now continued intermittently with intervals of freedom of no longer than one month. He was admitted to the R.N. Sick Quarters, Eastbourne, in November, 1943 and was transferred to the R.N. Hospital, Haslar, three weeks later. Investigations now showed an unhealed duodenal ulcer and hyperchlorhydria. He was treated for seven weeks and then discharged to the dietetic mess in the R.N. Barracks, Devonport, where he remained until April 1944 when he was admitted to the R.N.A. Hospital, Barrow Gurney, for rehabilitation. He joined the Special Diet Mess at Londonderry on 24th June, 1944 and was employed in the Drafting Department of the R.N. Barracks. He lost no time off duty but continued to have symptoms of dyspepsia and during the last nine months of his stay in Northern Ireland his longest period of freedom from symptoms was only ten days, and he took alkaline powders regularly in order to obtain relief. He drank no alcohol during the period of observation but continued to smoke 15 cigarettes per day. Intelligence testing showed him to be of average normal intelligence but he had a poor school record before entering the Navy as a boy. He served at sea for 3½ years during the war and served in Minesweepers and other small ships on the East Coast, at Dunkirk, where his ship was sunk, and in Atlantic and Russian Convoys.
He gave a history of mental stress and tension before any action and gunfire often caused him to have upper abdominal pain, and he also suffered from seasickness. There was no history of family or personal worry.
He gained 8 lbs in weight while under observation and when resurveyed in June, 1945 there were radiological signs of scarring in the duodenal cap but no evidence of active ulceration. Symptoms were still present at this time, and although the ulcer appeared to be healed it was considered that he might readily relapse under adverse conditions.

Case 15: Able Seaman, (H.O.), aged 35.
This rating first had dyspepsia in 1932 at the age of 23 when he developed attacks of vague epigastric discomfort after meals. These attacks occurred at intervals/

intervals of three or four months and lasted for only two or three days at a time. He attended his panel doctor occasionally and was given alkaline powders which relieved his symptoms. He had been free of symptoms for several months when he entered the Navy in 1941 but they returned after a few months service as an anti-aircraft gunner on board a merchant ship. He managed to continue on duty until 1943 when his symptoms became more severe and he now had regular pain after food, followed occasionally by vomiting. He was investigated in the R.N.A. Hospital, Barrow Gurney, in October, 1943 when a duodenal ulcer was found, together with hyperchlorhydria. He was discharged to 3 months Home Shore Service in December, 1943 but his dyspepsia recurred one week after he returned to duty. He was then admitted to the gastric mess in R.N. Barracks, Devonport, and remained there until admitted to the R.N.A. Hospital, Barrow Gurney, in April, 1944 for rehabilitation and was thence transferred to the Special Diet Mess in Londonderry on 24th June, 1944. He was employed on general duties in the R.N. Barracks and lost no time off duty but continued to have symptoms and complained of frequent discomfort and fullness in the epigastrium one hour after meals as well as flatulence and occasional constipation. Definite pain occurred on several occasions but the chief complaint was usually a sense of fullness rather than actual pain. There was no real remission of symptoms during the twelve months of observation. He had over two years service at sea as a gunner on board defensively armed merchant ships and experienced some enemy air attacks. There was no history of personal or family worry but he showed signs of chronic anxiety and admitted that he was not very happy in the mess. He also became moody and depressed at times and tended to resort to alcohol on these occasions. His weight showed very little variation, and when he was finally resurveyed in June, 1945 there was some pylorospasm present on radiological examination but the appearance of the duodenum suggested old scarring rather than active ulceration. There was also a moderate degree of hyperchlorhydria.

This man was of 'bright normal' intelligence but he was an unstable type of personality who showed little insight into his condition and although he improved under the regular regime, it was obvious that he required constant close supervision and was on the whole, an unsatisfactory case for employment in the scheme.

Case 18:/

Case 18: Able Seaman, (H.O.), aged 38.
This rating first developed dyspepsia at the age of 35 while serving in the United States, his main complaints being flatulence and vague epigastric discomfort. His symptoms became gradually more severe and he eventually reported sick in 1943 after returning to the United Kingdom. He was given a light diet for one month with little improvement but managed to carry on until March, 1944 when he was admitted to the Royal Sussex County Hospital with a perforated duodenal ulcer. Following convalescence he was admitted to the R.N.A. Hospital, Barrow Gurney, for rehabilitation and he joined the Special Diet Mess at Belfast in September, 1944. Radiological examination in July, 1944 showed persistent spasm of the prepyloric region, causing apparent narrowing of the antrum, which could be temporarily relaxed by pressure and there was no pyloric delay. There was persistent deformity of the duodenal cap but no ulcer crater could be identified and there was no local tenderness. He continued to have symptoms during the period of rehabilitation and these were persistent throughout his stay in Northern Ireland. He lost no time off duty however and when resurveyed in June, 1945 there was no evidence of active ulceration although symptoms were still present and he remained underweight. A test meal showed a high fasting acidity with defective neutralisation. He was a thin anxious type who became easily depressed and frustrated and psychogenic factors may thus have played a large part in determining his symptoms which had been almost continuous since his perforation, in spite of prolonged medical treatment and rehabilitation. He appeared to be a likely candidate for another perforation or for major surgical treatment at a later date.

The third or Catastrophic Type was characterised by complete freedom from symptoms of any kind until the onset of a major complication. That is, the first symptom might be a perforation or a severe haemorrhage and this group thus includes both Types B and C in Ogilvie's classification. After the complication has been treated, the patient may remain free of symptoms until/

until the onset of another haemorrhage or even a second perforation. On the other hand, many cases may first reveal themselves as a perforation or haemorrhage and then after an interval develop the clinical picture of the first or second groups.

A clear-cut distinction between the three types is largely artificial since each group may merge into another. The disease might be justifiably regarded as analogous to the modern concept of nephritis with its different stages which often merge imperceptibly into each other. Such a view regards the disease as a whole and considers that all its forms are due to the same aetiological factors and does not, in contrast to Ogilvie (1945), draw any distinction between the aetiology of the chronic ulcer and the perforating type. The latter is regarded merely as an incident in the natural history of the disease and the patient whose ulcer perforates is by no means immune from the further occurrence of the symptoms of peptic ulcer in their most typical form. This has been illustrated in the present study by the fact that one third of the cases who relapsed gave a previous history of perforation, and four such examples are described below.

Case 6: Able Seaman, R.F.R., aged 40.
First developed dyspepsia in 1941 at the age of 37, when he complained of epigastric discomfort between meals, relieved by food and alkalis. The first attack lasted/

lasted for only a few days but after an interval of several months the symptoms became more severe and continued to recur, with remissions. The remissions became shorter and in August, 1942 he was admitted to the Military Hospital, Gibraltar, with a perforated duodenal ulcer. After operation he was invalided to the United Kingdom and returned to duty, after a period of sick leave, in October, 1942. His former symptoms returned after a few weeks and he again reported sick, when he was placed on a light diet and was victualled from the Sick Bay but carried out his normal duties in a shore establishment. He managed to carry on until November, 1943 when he was admitted to the R.N.A. Hospital, Newton Abbot, with a recurrence of symptoms. A barium meal now showed a spastic duodenal cap and a duodenal ulcer was demonstrated. He was discharged from hospital in December, 1943 and entered the special diet mess in the R.N. Barracks, Devonport. He remained fairly well during the next few months and was admitted to the R.N.A.H., Barrow Gurney, on 14.4.44 for rehabilitation and admission to the peptic ulcer employment scheme. Xray investigations were not repeated in view of the previous history but a test meal showed very marked hyperchlorhydria. Intelligence = 'superior'. He joined the Special Diet Mess, R.N. Barracks, Londonderry, on 24.6.44 and complained of a return of epigastric pain three days later, the pain having no definite regular relationship to food and was not constantly relieved either by food or alkalis. On 4.8.44 he had a sudden attack of acute pain and was admitted to the U.S. Naval Hospital, Londonderry, as a possible perforation. He responded to medical treatment and was discharged after ten days but was treated for a further week in the R.N. Sick Quarters, Londonderry, before returning to duty. He continued to complain of frequent symptoms, took alkalis regularly, and seldom had more than a day of complete freedom from epigastric discomfort, but managed to carry on with his duties until 13.3.45 when he developed a severe attack of epigastric pain which necessitated his admission to the R.N.A. Hospital, Londonderry. He improved slowly and returned to duty on 28.4.45 after 46 days in hospital. His symptoms were much improved but he continued to have frequent discomfort although there was no real pain, and he took alkalis regularly. When resurveyed after 12 months service in the scheme he was found to have a large prepyloric ulcer and a test meal showed a very high fasting acidity and a climbing acid curve. During his stay in Northern Ireland he was employed on general duties in the Victualling Store of the R.N. Barracks and later in other departments of the establishment,/

establishment, but he was dissatisfied with his work after being moved from the Victualling Store and on the whole, he did not fit in well to life in the Special Diet Mess. In addition to feelings of frustration and resentment with regard to his employment, he had definite swings of mood towards depression which generally coincided with an exacerbation of his dyspeptic symptoms. There were also mildly obsessional traits in his personality. He smoked about 12 cigarettes a day throughout the period of observation and his alcohol consumption amounted to a total of eleven bottles of beer in twelve months.

The development of an ulcer in this case appeared to be definitely related to emotional factors and abnormal personality traits. At the time of onset of his first symptoms in 1941 he was serving in destroyers in the Mediterranean and took part regularly in Malta convoys and experienced considerable enemy action. His perforation occurred a few hours after he had received bad news from home. There was also a history of excessive tobacco and alcohol consumption before the onset of symptoms. As already noted, his relapses while under observation coincided with changes of employment to duties which he disliked, and were associated with changes of mood and depression. The tendency to recurrence appeared to be very strong in this case as shown by the original finding of a duodenal ulcer which perforated, to be followed by the development of a large active prepyloric ulcer within two years.

Case 7: Stoker Petty Officer, R.N., aged 32. This man's dyspepsia first began in 1935 at the age of 22 when he was serving in a submarine on the China Station. Symptoms were at first vague and irregular and consisted chiefly of flatulence and a feeling of fullness in the upper abdomen. These complaints returned from time to time but were never severe enough to cause him to consult a medical officer until November, 1943 when he was admitted to the U.S. Naval Hospital, Boston, Mass., with a perforated duodenal ulcer. Following operation and convalescence, he was invalided to the United Kingdom and was treated in the R.N.A.Hospital, Seaforth, Liverpool, from 31.1.44 to 2.3.44. He was then accommodated in the Special Diet Mess, R.N. Barracks, Devonport, until 14.4.44 when he was admitted to the R.N.A. Hospital, Barrow Gurney for rehabilitation with a view to admission to the 'gastric scheme'. Investigations now showed a persistent deformity of the duodenal cap and a large ulcer niche was demonstrated. Test meal - hyperchlorhydria/

hyperchlorhydria. Intelligence - 'bright normal'. He joined the Special Diet Mess at Londonderry on 24.6.44 and for the first few weeks he was discontented with his work as he did not have a definite job, and he was also worried about his wife's pregnancy. These worries were accompanied by a mild attack of dyspepsia. He was then given regular employment as a crane driver in the Naval Repair Yard and remained very well throughout the remainder of his stay in Northern Ireland. He was subject however, to occasional attacks of epigastric fullness or discomfort, but this seldom lasted for more than one day at a time and he lost no time off duty on account of dyspepsia or any other cause. He continued to smoke a pipe and drew his naval tobacco and rum rations but drank no other form of alcohol except when on leave. He usually had mild symptoms after returning from leave. There was a previous history of excessive smoking and periodic over-indulgence in alcohol before his ulcer perforated. He experienced a good deal of enemy action in small craft in the English Channel in the early part of the war and was also a survivor from H.M.S."Dorsetshire" in 1942, and was wounded in the feet during this action, and was also adrift for 30 hours before being picked up. When reinvestigated in June, 1945, the duodenal cap was seen to be deformed but there was no evidence of active ulceration. Hyperchlorhydria was present as before. His weight had remained stationary throughout the period of observation. This was a stable intelligent type of individual who had no obviously abnormal personality traite but on the whole showed himself to be conscientious and sensitive and was inclined to look upon the gloomy side of life. It is to be noted that his perforation followed a lengthy period of service at sea, including much action, wounding and the sinking of a ship, but he carried on for two more years before the ulcer perforated.

Case 10: Able Seaman, (H.O.), aged 20.
This rating first developed dyspepsia at the age of 17 when he complained of flatulence, epigastric discomfort and a feeling of hunger, relieved by food. He consulted his panel doctor and was given an alkaline powder which relieved his symptoms and he had no further trouble until he entered the Navy a year later. Soon after joining the service his symptoms returned and he now had intermittent attacks of definite epigastric pain, lasting for about a week and followed by remissions of about six weeks. In September, 1943, that is, nearly three years after the first onset of symptoms, he was admitted to the R.N. Sick Quarters, Cullercoats, with/

with a perforated gastric ulcer. Operation revealed a perforation low down on the lesser curvature of the stomach. His symptoms returned within a few weeks of the operation but a barium meal in November 1943 showed no evidence of active ulceration. A test meal showed very high hyperchlorhydria. He improved on a dietetic regime but was not entirely free from dyspepsia when admitted to R.N.A.H., Barrow Gurney in April, 1944 for admission to the 'gastric scheme'. He responded rapidly to rehabilitation however, and proved to be one of the best workers in the group and joined the Special Diet Mess at Londonderry on 24.6.44. It was found however that there was no suitable employment available for him in his capacity as a D.E.M.S. rating. He was therefore employed on general duties of a casual nature in the meantime but he felt that he had too little to do and became very discontented. After two or three weeks his symptoms returned and he developed a continuous ache in the epigastrium and began to lose weight. He was admitted to the R.N. Sick Quarters for fourteen days and his symptoms cleared up. An attempt was now made to find more suitable employment for him but in spite of this, his discontent increased and he became somewhat depressed and complained that he was in a 'deadly job'. He remained free of further symptoms however but it became obvious that he was a misfit in the scheme and he was discharged to his depot in August, 1944 for disposal on the grounds that no suitable employment was available for him. Intelligence tests had shown him to be of average normal intelligence.

Comment: The history of this case shows that the ulcer perforated after he had had fourteen months strenuous service at sea as an anti-aircraft gunner on board merchant ships in Russian convoys. His symptoms were always worse after experiencing any action and he usually felt considerable mental tension and strain while at action stations. He had also been worried about the safety of his mother during the air raids on this country and worry appeared to aggravate his dyspepsia. The failure of this man to fit into the regime in Northern Ireland serves to emphasize the importance of selection, particularly with regard to employment. It is not enough to provide regular meals and a suitable diet, as dietetic factors and gastric irritants occupied only a very minor place in this case. If the man himself is not satisfied and contented with his work and his environment he will continue to have symptoms and possibly further complications. This case was considered to be a likely candidate for surgical treatment in the future, in view of the high acidity associated with the presence of a gastric ulcer.

Case 11:/

Case 11: Steward, (H.O.), aged 36.
This rating had no history of dyspepsia until July, 1943 (aged 34), when he was admitted to St. Stephen's Hospital, Fulham, with a perforated duodenal ulcer, whilst on leave. He remained well for eight months after operation and then developed epigastric discomfort after meals and began to lose weight. These symptoms had been present for about a month before he was admitted to R.N.A.H., Barrow Gurney, in April, 1944 for rehabilitation. Investigations now showed a persistent niche in the duodenal cap and a duodenal ulcer was considered to be present. A test meal showed a high acid curve. Intelligence - 'superior'. After joining the Special Diet Mess at Londonderry in June, 1944 he had several attacks of epigastric pain or discomfort at intervals of about eight weeks. He also became constipated from time to time. He lost no time off duty on account of dyspepsia, but was treated in hospital for ten days in December, 1944 for a large boil on the buttock. He was employed as a steward in the R.N. Barracks and as a relief steward on board ships in the harbour and was quite happy in his work. During his first few months in Northern Ireland he had a good deal of anxiety as the result of the illness of his wife and the fact that she was living in London during the V-bomb attacks. He was teetotal but continued to smoke 20 cigarettes a day. His weight remained under the average for his age and height throughout the period of observation. Reinvestigation in June, 1945 revealed no evidence of active duodenal ulcer but there was still a marked hyperchlorhydria with defective neutralization.

Although a history of previous dyspepsia may be obtained in most cases of perforation or haemorrhage, there does appear to be a group of cases who remain free of symptoms between each complication. Alvarez (1944b) suggests that there is a diminished sensitivity to pain in such patients so that symptoms are not noticed or remain minimal until a complication occurs. This may also be seen in the mildest examples of the first main clinical group (Episodic Type) who present only very mild symptoms from time to time and may never be fully investigated or considered to be the subjects of

peptic/

peptic ulceration, and an earlier history may be overlooked when a perforation or a haemorrhage supervenes. The Catastrophic Group therefore does not always have an acute ulcer as Ogilvie (1945) suggests, but may have a chronic ulcer which is symptomless except when an acute complication occurs. Case 67, already described on page 91, remained completely free of symptoms during an interval of fourteen months between two perforations, although there was a history of dyspepsia in this case before the occurrence of the first perforation. Another patient remained completely symptom free throughout the period of observation although he had a duodenal ulcer with a well marked radiological crater, his only previous symptoms having been two major haemorrhages, each of which had followed a period of anxiety.

Case 30: Able Seaman, (H.O.), aged 21.
This rating was perfectly well until February, 1943 (aged 19) when he suddenly felt giddy and fainted. This was immediately followed by a profuse haematemesis and he was admitted to the East Suffolk and Ipswich Hospital for further treatment. He made a rapid recovery, was discharged to duty at the R.N. Base, Lowestoft, where he was surveyed and found unfit for service in Coastal Forces and was then drafted to the R.N. Barracks, Devonport. A few weeks later he joined a shore establishment in Scotland and in view of his previous medical history, he was discharged to the R.N.A. Hospital, Kilmacolm, for gastric investigation. Although he had no symptoms at this time, a duodenal ulcer was found and he was returned to the R.N. Barracks, Devonport, in June, 1943 and was victualled in the Special Diet Mess. In December, 1943, as he still felt perfectly well, he volunteered for sea service and was sent to the R.N.A. Hospital, Newton Abbot for reinvestigation. The diagnosis of duodenal ulcer was again confirmed and he was now recommended for Permanent Shore Service. While serving at Poole, Dorset, in February/

February, 1944 he had a second haematemesis and was admitted to the R.N.A. Hospital, Sherbourne, where investigations subsequently showed that a duodenal ulcer was still present, and he was transferred to the R.N.A. Hospital, Barrow Gurney in April, 1944 for rehabilitation. He joined the Special Diet Mess at Londonderry on 24th June, 1944 and lost no time off duty during the next twelve months. He remained completely free of symptoms except for one isolated attack of pain in August, 1944 which occurred just after he had received news of his brother's death on active service. Each haematemesis had also coincided with a period of intense anxiety following the death of his parents and the breaking up of the home. When resurveyed in June, 1945 a small duodenal ulcer was demonstrated on radiological examination and a test meal showed well marked hyperchlorhydria. He was of 'superior' intelligence and had a stable personality, nor did mechanico-chemical factors appear to play any part in the onset of his ulcer.

Similar features were also shown by the following case:-

Case 32: Stoker, (H.O.), aged 39.
This man had no symptoms of peptic ulcer until January, 1942 when he suddenly felt faint and then had a severe haematemesis followed by melaena. He was admitted to the R.N. Hospital, Port Edgar, where he was given a blood transfusion and was later transferred to Bangour Hospital where he made an uninterrupted recovery. He returned to full duty and remained quite well and free of symptoms until March, 1944 when he had a second severe haemorrhage, which again necessitated a blood transfusion. He was treated on this occasion in the Birkenhead General Hospital and was later transferred to the R.N.A. Hospital, Seaforth, Liverpool, where investigations revealed the presence of a duodenal ulcer and he was admitted to the R.N.A. Hospital, Barrow Gurney in May, 1944 for rehabilitation. He joined the Special Diet Mess at Londonderry on 24th June, 1944 and remained well until February 1945 when he reported sick and complained of epigastric pain which had been present for two days and also stated that he had passed a black stool. He was admitted to the R.N.A. Hospital, Londonderry, where the presence of melaena was confirmed, and he was treated in hospital for 53 days. There was no further pain or melaena but he complained of frequent vague discomfort or fullness in the epigastrium, which was relieved by alkalis. His general nutrition/

nutrition showed a marked improvement during the period of observation and he gained nearly two stones in weight. Investigation in June, 1945 showed no evidence of active gastric or duodenal ulcer but there was marked hyperchlorhydria. He was a stolid unimaginative type of individual of 'dull normal' intelligence and neither psychogenic nor mechanico-chemical factors appeared to play much part in the genesis of his duodenal ulcer. He differed from the last case in that his third attack of melaena was followed by the onset of vague dyspepsia. The strong tendency to haemorrhage in this case suggested that he was a possible candidate for radical surgical treatment at a later date.

The first and third of these clinical groups have been recognised clearly enough in the past but the second or Continuous Type has been insufficiently emphasized in the literature until recently, when Love (1943) did much to clarify the interpretation of the symptoms of gastro-duodenal dyspepsia. In a detailed study of the dyspeptic symptoms of 358 soldiers, this author found that in 90 per cent. of cases abdominal pain was the presenting symptom. This could be divided into (a) post-prandial pain, (b) continuous pain, and (c) pain unrelated to meals. The post-prandial type of pain, in its most typical form is relieved by food and alkalis and is termed 'hyperchlorhydric' pain while the continuous type, which is not relieved by food and alkalis, is referred to as 'dyskinetic' pain and is believed to have a different mechanism to the former type. The hyperchlorhydric type of pain is believed to be almost certainly gastro-duodenal in origin, but the dyskinetic type may be gastro-duodenal,/

gastro-duodenal, colonic, biliary, hepatic or even central in origin. It was found that 48 per cent. of patients with active duodenal ulcers complained of the hyperchlorhydric type of pain but that only 27 per cent. of men suffering from this type of pain had active duodenal ulcers, and in the symptom complex of this type there appears to be nothing to distinguish the ulcer patient from the one in the same group who has no radiological signs of ulcer. The other characteristics of the hyperchlorhydric group were the relatively low incidence of neurosis and the relatively high incidence of hyperchlorhydria, whereas in the dyskinetic type there was a high percentage of neurosis. The chance of the existence of an organic lesion in the latter type of patient was considered to be about 1 in 40 compared with 1 in 4 in the hyperchlorhydric type and 1 in 10 in mixed or 'gastritic' types. With regard to the management of the dyspeptic soldier, Love considered that the man with the hyperchlorhydric or duodenal ulcer type of dyspepsia was usually a good type who was eager to serve and who could often carry on quite well in his unit for a time, but the risks of possible perforation or haemorrhage had to be borne in mind in carrying out such a course. The mixed 'gastritic' type conformed to the dyskinetic group in the difficulty of relieving symptoms and managing the man/

man to the best advantage. It was also emphasized that many men with gastric ulcer complain of this type of dyspepsia, and that these very men may appear to be the most typically neurotic, but an exact pathological diagnosis is of no importance from the point of view of handling, treatment and disposal. It is clear that the cases of the present series which have been termed the 'Continuous Type' correspond with Love's description of the dyskinetic group of dyspepsias.

The recognition of these main clinical types of peptic ulceration gives rise to a number of important considerations which have important bearings upon prognosis and treatment. From the point of view of preserving manpower in the armed forces and in industry, it would clearly be important to know whether there is any difference between the relapse rate and the time lost through sickness in the three groups which have been differentiated in the present study. The second, and perhaps the most important question with regard to management, is whether it is necessary to treat all three types under the same type of regime after their ulcers have clinically healed. In other words, does a permanent dietetic regime benefit the case with long remissions or the case who remains well until there is a further major complication, to the same extent as it may benefit a case of the continuous type who is seldom/

seldom free from symptoms? Thirdly, what is the frequency of each type, what is the relative frequency of complications, and what factors are related to the occurrence of each clinical group? Lastly, what symptoms and signs indicate a recurrence of active ulceration in the first and second types? It would appear to be of particular importance to recognise the presence of activity in the continuous type since the cases of this group have seldom any remission of symptoms.

Prognosis in Relation to Clinical Groups: Although the numbers studied have been too small to permit of any estimation of the frequency of the different clinical groups, some useful information has been obtained with regard to the management of each type, and the factors which may influence a recurrence of symptoms have also been studied. Table XVI compares the three groups with regard to incidence, history of complications, relapse rate and average incapacity per case of relapse.

TABLE XVI./

TABLE XVI.

	No. of Cases.	No. of Cases with History of Complications.		No. of Cases of Relapse.	Percentage Loss of Working Time.	Average Incapacity per Case of Relapse.
		Perfor-ation.	Haemorr-hage.			Days.
Episodic Type	53	12	12	22	6.56%	15.64
Continuous Type	12	7	1	7	13.17%	39.57
Catastrophic Type	4	2	2	1	15.49%	53
Total	69	21	15	30	8.78%	22.47

It is seen that both the relapse rate and the average length of time off duty were higher in the continuous type than in the first group which represents the usually accepted typical clinical picture of peptic ulcer. The details of the catastrophic group are included for the sake of completeness but a much larger series would be required in order to make an exact statistical comparison between the three groups.

Diagnosis and Prevention of Recurrences: The difficulties of relating symptoms to the presence of active ulceration have already been mentioned while discussing the findings of Allison (1943a), Love (1943) and Gill (1947). It is clear that no single symptom or sign apart from a major complication, can be accepted as unequivocal evidence of the recurrence of active ulceration but a combination of symptoms may provide strong presumptive evidence and indicate the need for a radiological examination in order to confirm the activity of the ulcer. Love considers that a change in the type of pain is significant in indicating the possible onset of an acute exacerbation or complication.

In the present series, any case who presented symptoms of a recurrence of regular pain after meals with food relief, or night pain, and persistent loss of/

of weight, was regarded as suffering from a relapse sufficient to require further treatment. It was considered that all of these symptoms were unlikely to be present together in one patient unless his ulcer were active. The investigations at the end of the experiment however, showed that 25 per cent. of those with no radiological evidence of ulcer, still had symptoms of dyspepsia, while of those with positive radiological signs of ulceration, 38 per cent. had only occasional mild symptoms and 8 per cent. had no symptoms of any kind.

These findings thus confirm the view that the occurrence of the symptoms of gastro-duodenal dyspepsia does not necessarily coincide with the presence of active ulceration. This is particularly true of the 'continuous type' in whom psychogenic features may be prominent and who may provide a most difficult diagnostic problem between peptic ulceration, nervous dyspepsia and psychoneurosis. These conditions may overlap and the patient who appears to be the most neurotic may nevertheless develop a peptic ulcer. Even more difficult in this type of case is the recognition of a recurrence of active ulceration in the patient with a previous history of proved ulcer. Only a full physical and psychological assessment will lead to a correct diagnosis but the danger of over-investigation/

over-investigation must be avoided otherwise any psycho-neurotic features may well be aggravated and so add to the difficulties of management.

The results of the experiment (Tables XII and XIV) have shown that 43 per cent. of cases suffered from a relapse of symptoms sufficient to cause incapacity for duty and the men also showed a greater liability to sickness than the general population of the Royal Naval Barracks which contained a large proportion of men in low medical categories. The question which now obviously arises is whether the conditions provided for the men employed in the Royal Naval scheme were of any real value in preventing relapses.

In a recent study, Gainsborough and Slater (1946) found that over 50 per cent. of cases of peptic ulcer had relapsed within twelve months of discharge from hospital. Medical treatment was disappointing, not with regard to the healing of the ulcers, but in the prevention of relapses after return to work. It was recommended by these authors that attention should be paid in the follow-up period to the adjustment of work conditions, the use of resettlement facilities under the Disabled Persons (Employment) Act, 1944, and to the careful discussion with the patient of his social and psychological problems. In the naval experiment attention was paid to these details and the conditions provided/

provided were undoubtedly superior to any which could have been arranged in civilian life, with the important exception that the men were not living at home and were still under naval discipline. Care was taken however, to see that their social and psychological problems were suitably adjusted and that no man was employed or retained in the scheme against his will, while still remembering that the primary object of the experiment was the preservation of skilled manpower for service in the Royal Navy. In view also of the highly selective nature of the cases, why should there have been a failure to obtain a relapse rate of less than 43 per cent? Does this suggest that the natural history of the disease results in a definite rate of relapse irrespective of the aftercare given to the patients? The experience of Raimondi and Collen (1946)suggests that the recurrence rate of symptoms in treated cases of peptic ulcer is remarkably constant even after satisfactory therapeutic results have been obtained.

It is known that a small proportion of cases of perforation may be able to lead an ordinary life after operation and some of the case histories studied in the Royal Navy have suggested that this may also be true of a few cases with a history of haemorrhage, in spite of the presence of a chronic ulcer (Cf. Case 30).

It is believed by some, including Alvarez (1946),that the/

the adherence to a strict regimen is not certain to help unless the patient is able to lead a calm life. It is thus doubtful whether such a regime is essential to the well-being of the patient with a symptomless ulcer. From the therapeutic point of view, Ehrmann (1947) considers it preferable to distinguish between the profusely bleeding ulcer, the painful ulcer and the latent type. Bockus (1943) on the other hand, is of the opinion that those patients who develop haemorrhage and perforation early in the course of the disease will show a greater incidence of ulcer intractability and other complications than those who have had repeated recurrences unassociated with a serious complication. This would suggest that in order to prevent any relapse all the clinical groups should be subjected to the same strict management which should be even more strictly enforced in the cases who give a history of previous complications than in any other group. While there is no doubt that the regime followed in the Royal Naval experiment was beneficial to all three types of peptic ulcer, it is doubtful whether the small series of cases whose ulcers appeared to be silent would have suffered from any great disadvantage had they been living under ordinary conditions. The value of short periods of rest on a restricted diet has already been emphasized and there is little doubt that such a course was

useful/

useful in preventing more serious relapses in many cases of the episodic type. It was the 'continuous' group however, who appeared to derive the greatest benefit from a regular regime such as that outlined in this thesis. It is not the diet or the regular meals which is of primary importance however, but the management of the patient as a whole and experience showed clearly that the most important and most valuable features of the scheme were the individual supervision and regular interviews with the medical officer. Such interviews gave the patients the opportunity of discussing their problems freely and enabled the medical officer to apply the principles of simple common-sense psychotherapy as outlined by Ross (1937), when necessary.

In discussing the therapeutic control of peptic ulcer, Ingelfinger and Moss (1945) consider that some ulcers will recur no matter how carefully the patient is handled. On the other hand, they believe that a suitable regime will, in a large number of cases, reduce the chances, frequency and severity of recurrences. These authors recommend a regimen embodying the following principles:- (1) Education of the patient; (2) Psychotherapy; (3) Dietary management, with interval feedings; (4) Regulation concerning alcohol and tobacco; (5) Follow-up observations and (6) Preparedness so/

so that the patient who is exposed to a circumstance known to aggravate peptic ulcer can adopt an intensified therapeutic regimen before any symptoms develop. This is, in effect, a similar programme to that adopted for the rehabilitation of the cases who were employed in the Royal Navy's experiment, and while it cannot be claimed that the regime was successful in preventing relapses, it has been shown that the majority were improved in health and 68.5 per cent showed no evidence of active ulceration at the end of the experiment.

CAUSES OF RECURRENCE.

The possible causes of relapse of symptoms in cases of peptic ulcer cannot be separated from the factors which may be concerned in the aetiology of the disease, and which have been well reviewed by Eusterman (1939). In this country, the main emphasis in the past has been on mechanico-chemical factors such as gastric irritation and the action of excess of free hydrochloric acid on the gastric mucosa. Greater attention has been paid in recent years however, to the psychosomatic aspects of the disease (Davies and Wilson, 1937; 1939; Wilson, 1939; Lancet, 1942: Gainsborough and Slater, 1946), while Hurst (1946) stated in his last published work that in general, local irritation is the main exciting cause/

cause of gastric ulcer, whereas anxiety is of greater importance in duodenal ulcer and is a common cause of recurrence and of the sudden increased activity of ulceration which results in haemorrhage or perforation. Jordan (1945) states that the factors favouring recurrence of peptic ulceration are unquestionably of two groups, the first consisting of the relatively uncontrollable ones, such as emotional disturbances, fatigue and nervous tension. The second group consists of the easily controllable factors, such as smoking, dietary care, rest, exercise and alcohol. These two groups are said to act synergistically and if the second group is always under control, the inroads of the first group are much less disastrous. In the individual case, the relative importance of these two sets of factors must vary enormously with the temperament and usual habits of the patient. In some cases the effects of one group of factors may be balanced by those of the other group and a relapse may only occur when this balance is upset by any increase in the influence of one or other group. For example, alcoholic excess is not the cause of peptic ulcer but may well precipitate a relapse or a complication in a patient with a healed ulcer. In another subject however, the worry and mental tension caused by business or family problems may well be eased by the sedative effects of small doses of alcohol/

alcohol which may thus actually benefit the sufferer from peptic ulcer.

Practical Experience in the Royal Navy: Some of the apparent precipitating causes of relapse have been mentioned in the case summaries which have already been described, but an attempt has also been made to study the possible causes of recurrence which may be considered under the following headings:-

A. Mechanico-chemical Factors.

Diet - Gastric irritants
Irregular meals
Hurried meals
Food allergy

Defective teeth

Alcohol

Hyperchlorhydria

Tobacco

Hypoglycaemia.

B. Psychogenic and Neurogenic Factors.

Frustration - Service life
Personal affairs
Insecurity

Domestic worry

Personality - Lack of adaptability
Obsessional tendencies

Relation to last leave

Aerophagy

Central nervous lesions (Hypothalamus)

Migraine

C. Other Factors.

Seasonal

Infection and toxaemia -

Fatigue

Respiratory infections
Other infections
Curling's ulcer

Excessive physical strain.

D. Endogenous.

No apparent precipitating cause - 'Ulcer Diathesis'.

Mechanico-chemical Factors. Diet: There has been general agreement that the inability to tolerate ordinary service rations was one of the main factors in precipitating the breakdown in the armed forces of dyspeptics who had subjected themselves to dietetic restrictions in civilian life (Payne and Newman, 1941; Allison and Thomas, 1941; Wade, 1942). The diet provided in the Special Diet Messes in Northern Ireland conformed to the modern conception of the dietetic treatment of peptic ulcer as described by Dunlop (1942), Allison (1945a) and Davidson and Anderson (1947), and since over 90 per cent. of the meals provided were consumed by the men in their own mess, there is no evidence to suggest that dietetic indiscretions were common during the period of observation. Some ratings however, were undoubtedly careless with their diet whilst on leave although they were provided with the necessary certificates for obtaining the extra rations allowed by the Ministry of Food, so that theoretically there was no break in the continuity of the dietetic regime. Since the arrangements of the scheme also eliminated irregular and hurried meals and allowed the supply of intermediate feeds, there was no reason to attribute recurrent symptoms/

symptoms to any of those factors and although the habit of bolting food may prove difficult to eradicate, personal observation during meal times showed that the majority of the men appeared to have benefitted by the advice given to them during the period of rehabilitation. There is no evidence from any of the published studies that irregularity of meals per se, played any important part in determining the symptomatology of cases of peptic ulcer in the Royal Navy, and it has already been shown that the naval system of watchkeeping was not detrimental to the cases studied in the present series. It is also of interest to note that Bashford and Scott (1935) considered that irregularity of hours of work and of meal times were probably of less importance than was usually supposed.

Food Allergy: The importance of food intolerance or allergy as a cause of dyspepsia has been stressed by Alvarez (1944b) and was noted by Allison and Thomas (1941b) in association with a history of migraine in a number of naval cases of peptic ulcer. The association of a history of migraine in 10 per cent. of cases of peptic ulcer was confirmed in the present series, but none of these showed any evidence of food allergy although one patient gave a history of asthma in childhood.

Defective Teeth: Dental defects were not found to play any part in causing a recurrence of symptoms since all/

all outstanding abnormalities were treated before the men were accepted for employment in the rehabilitation scheme. Any subsequent dental complaints were also treated as they arose. The part played by defective teeth in the aetiology of peptic ulcer may be either through the effects of associated sepsis or as seems more likely, as the result of inadequate mastication combined with the bolting of food.

Alcohol: A history of alcoholic excess was found in only a small number of the cases studied by Allison and Thomas (1941) and Wade (1942) and there is no evidence to suggest that this factor played a major part in the aetiology of peptic ulcer in the Royal Navy. In the present series, alcohol was consumed by 50 per cent. of the cases of relapse but was in most instances confined to the service ration of rum. In only two cases was alcohol the only apparent precipitating factor while alcohol and tobacco were the only precipitating factors elicited in four other cases. In nine cases, or nearly a third of the cases of relapse, alcohol was associated with a number of other probable aggravating factors, particularly those of the psychogenic group.

Tobacco: Although it is fifteen years since Ryle (1932) pointed out that it is very difficult to obtain concise proof with regard to the part which the smoking habit plays in the symptomatology of peptic ulcer, most textbooks of medicine still support the view that

tobacco/

tobacco is a gastric irritant (Tidy, 1945; Hurst, 1946; Dunlop, Davidson and McNee, 1946). Jordan (1941; 1945) however, considers that tobacco ranks with fatigue and tension as the most frequent cause of recurrence and should therefore be banned permanently in peptic ulcer patients. Held (1942) and Ehrenfeld and Sturtevant (1941) support this view, but Ingelfinger and Moss(1945) consider that if the attempt to give up smoking leads to an increase of tension, the denial of tobacco may do the individual's gastro-intestinal tract more harm than good. A recent statistical survey by Jamieson, Illingworth and Scott (1946) of the smoking habits of a large series of patients with a history of peptic ulcer, has suggested that the relationship between smoking and severity of symptoms is indirect and dependent upon age; symptoms tend to be severe in the young and mild in the old; and cigarette smokers are in the main young, while pipe smokers are in the main old.

In the present study, there was evidence of excessive smoking in half of the cases of relapse but in most cases this factor was associated with the consumption of alcohol or with the presence of factors of the psychogenic group. In only two cases was excessive smoking the only apparent aggravating factor in the history. A study of the weekly progress records of/

of the whole series suggests that symptoms of minor dyspepsia were more common in the heavy smokers than in the light smokers and non-smokers. It might well be that a patient who shows no obvious signs of anxiety or mental tension and who has no abnormal personality traits, does not require to use tobacco or alcohol in excess. Whatever the explanation, the experience of the naval cases strongly suggests that the part played by alcohol and tobacco as aggravating factors in the aetiology of peptic ulcer must be associated with the psychological aspects of the case.

Hyperchlorhydria: No matter what views are held on the mechanism of peptic ulcer pain production, it is common ground that free hydrochloric acid is of great importance in preventing the healing of the ulcer (Douthwaite, 1947) and although Nicol (1939) has demonstrated the difficulties of controlling acidity, nevertheless the reduction of acid secretion is still the aim of most forms of treatment whether these be medical or surgical (Illingworth, 1945; Wood, 1945). Horder (1946) considers that if the view be taken that peptic ulcer is a disease in which the ulcer is an incident, treatment should begin before ulceration appears; whether the pre-ulcer stage be termed "acid dyspepsia" or "hyperchlorhydria", or be given some other/

other name, does not matter so much as does the recognition of the clinical type of gastroduodenal dyspepsia concerned.

Test meal findings in the present study showed that marked hyperacidity was present in over 75 per cent. of the cases investigated. The levels of free hydrochloric acid were equally high in patients who remained free of symptoms and in many who relapsed, and no useful observations were possible with regard to the role which hyperchlorhydria may play in the symptomatology of the disease.

Hypoglycaemia: Hypoglycaemia is a recognised complication in a number of cases who have been subjected to partial gastrectomy (Gilbert and Dunlop, 1947) and it is also known that insulin, through its hypoglycaemic action, is one of the most powerful stimulators of gastric secretion (Wright, 1945). Evensen (1942) found that the majority of patients with gastric ulcer or duodenal ulcer have a normal blood sugar curve whether the examination is made during a period of pain or not. Abrahamson (1945) has recently investigated the role which hypoglycaemia may play in the aetiology of peptic ulcer and considers that the disease is associated with hyperinsulinism although it cannot be said that hyperinsulinism precedes the ulceration or is causally related to it.

A fairly common complaint amongst cases of dyspepsia in/

in the Royal Navy was of a feeling of 'emptiness' or uneasiness, unaccompanied by pain, usually occurring two or three hours after food and most commonly noted in the early morning before breakfast. This symptom was generally relieved by taking food and the description was very suggestive of the early symptoms of a hypoglycaemic state. There may possibly have been an associated fall in the level of the blood sugar but no confirmatory investigations were carried out.

Psychogenic and Neurogenic Factors: In view of the present-day interest in the psychosomatic approach to the problem of peptic ulcer, it is of historical interest to find that in 1825, when diseases in the Royal Navy were first classified according to a definite nomenclature, dyspepsia was not classified as a disorder of the stomach, but as a neurosis (Allison, 1943b). Although Wolf and Wolff (1943) have done much to clarify the mechanism through which the emotions may affect the digestive function, it is still difficult to say how early psychological factors may play a part in the development of symptoms, and it is also impossible to say whether such influences are primary or secondary (Allison and Thomas, 1941b). In their ultimate effects however, it seems to matter little whether they are primary or secondary since it is assumed that the excess worry or tension acts through the hypothalamus and the autonomic/

autonomic nervous system in setting up an abnormal pattern of neuromuscular activity in the stomach, through the vagus, with resulting hypersecretion and hypermotility (Cushing, 1932; Clark, Beattie, Riddoch and Dott, 1938).

The results of an investigation into the psychological aspects of the cases reviewed in this thesis have already been shown in Tables VIII and IX, and these factors have also been studied in relation to the recurrence of symptoms. Half of the 30 cases of relapse showed no evidence of anxiety or other psychogenic factors at the time of recurrence of symptoms, but two or more such factors were present in 10 of the remaining patients or one third of all cases of recurrence. Twelve men showed evidence of frustration or resentment in connection with their service life or personal affairs; nine had domestic worry and four cases also found difficulty in adapting themselves to service life and to life in the special diet mess. The latter also displayed mildly obsessional traits from time to time. These findings together with those in Tables VIII and IX, are similar to those of Allison and Thomas (1941b) who found that the same personality trends seen among gastric patients in civil life were often encountered in naval cases - overconscientiousness, sense of frustration, obsessional tendencies and swings of mood towards depression. Domestic worry has been frequently/

frequently noted as a cause of anxiety in cases of peptic ulcer and was one of the commonest causes of anxiety in naval psychiatric cases (Tooth, 1944), while digestive disturbances were also frequent amongst cases seen by naval psychiatrists (Stephenson and Cameron, 1943).

If the exact point of time in the history of cases of peptic ulcer when psychogenic factors have their maximum influence is still uncertain, there is no doubt that the complications of the disease may be precipitated by such influences. Thus Davies and Wilson (1939) found that events capable of producing unusual emotional tension preceded haematemesis and perforation in 63 out of 75 patients, while disturbing situations and events acting as precipitating factors by causing anxiety to the patient were found to precede the onset or return of symptoms in 84 per cent. of 205 patients with peptic ulcer. A similar increase of mental tension and anxiety is also believed to have been the cause of the increased incidence of perforations in certain areas during the worst years of the recent war (Stewart and Winser, 1942; Short, 1942; Wilson, 1942; Riley, 1942; Spicer, Stewart and Winser, 1944; Illingworth, Scott and Jamieson, 1944) and Alvarez (1944a) has emphasized the necessity of applying prophylactic measures at times of emotional crisis in the life of the subject of peptic ulceration.

In/

TABLE XVII.

Incidence of Precipitating Factors in Cases with a Previous History of Haemorrhage or Perforation.

	Haemorrhage.			Perforation.		
Diagnosis.	Gastric Ulcer.	Duodenal Ulcer.	Jejunal Ulcer.	Gastric Ulcer.	Duodenal Ulcer.	Total.
No evident Precipitating factor.	-	3	-	1	5	9
Definite history of preceding events causing increase in emotional tension.	3	6	1	4	9	23
Doubtful evidence of increase in emotional tension.	1	1	-	-	2	4
Total:	4	10	1	5	16	36

In the present series there was a history of one or more previous complications in 36 cases, and in 23 of these there was evidence of increased emotional tension preceding the onset of haemorrhage or perforation. In 4 cases the evidence of such a precipitating factor was doubtful and in the remaining 9 patients there was no history of any apparent precipitating cause. These results are shown in Table XVII.

Relation to Last Leave: A number of ratings frequently complained of a mild return of symptoms whilst on leave or for a few days after returning from leave, amd a study of the weekly case records has revealed that 42.86 per cent. of the whole series complained of dyspepsia at the first interview after returning from long leave. Four ratings or 5.7 per cent. complained of symptoms after every leave (three or more occasions) during the period of the experiment; complaints on two occasions were made by 10 ratings or 14.3 per cent. while 16 men or 23 per cent. complained on one occasion only. With regard to the cases who relapsed, the recurrence of symptoms began whilst on leave in two cases, nine cases began within two weeks of returning from leave, seven began within three or four weeks and the remainder began at least four weeks or longer after leave. Most of these patients attributed the return of symptoms to the change of routine and diet, while 14 cases/

cases also blamed the long journey between England and Northern Ireland as an aggravating factor in the recurrence of their dyspepsia. These findings are rather surprising in view of the common experience in civilian practice (Dunlop, 1942) of the marked therapeutic effect which a holiday frequently produces on the subject of peptic ulceration. It is obvious however, that the mere fact of going on leave usually introduced a number of possible aggravating factors including a change of diet, increased consumption of tobacco and alcohol, the fatigue of a long journey, and exposure to respiratory and other infections. The most potent influence was most probably an increase in emotional tension resulting from family reunions after months of separation, together with the domestic worries which often appeared to become magnified after such periods of separation. Other problems faced by the married men, included the shortage of housing accommodation and the necessity of living with parents or other relatives under overcrowded conditions.

It is thus difficult if not impossible to separate and assess the importance of the many possible aggravating factors which were liable to influence the patients during leave periods, but there seems little doubt that the emphasis must be placed on the psychogenic group.

It is also of some interest to note that the

earlier/

earlier histories of the cases revealed that 7 cases of perforated duodenal ulcer were directly related to leave and 1 case of haematemesis from a gastric ulcer also showed this relationship. Two of the patients perforated whilst on leave and the remainder occurred shortly after the men had rejoined their ships.

Aerophagy: Although air-swallowing was a feature of 12 out of 30 cases of relapse, it could not be said that its presence had much diagnostic value in favour of an emotional disturbance, nor could to be incriminated as a possible cause of recurrent symptoms since at the time of resurvey, it was demonstrated radiologically, to a marked degree, in 6 cases who were completely free of symptoms.

Other Factors. Seasonal Variation: Other factors which may affect the recurrence rate of peptic ulceration include the seasonal variation in the incidence of the disease, which has been fully discussed by Einhorn (1930) and more recently by Sällström (1945b) who quotes two prevailing views. One group of authors considers that an increase in ulcer cases occurs during the winter months, between December and February, while others have described an increased incidence in autumn and spring, with peaks during September - November and March - May. The common feature is that the summer months show a minimum, and the autumn and winter months

a/

a maximum incidence of the disease. In this country, Moynihan (1912) and Ryle (1932) both found that relapses were more common in the winter months. The seasonal distribution of the relapses in the present study also showed that the majority occurred in the winter months between December and March, although the series was too small and the period of observation too short to allow any significant conclusion to be drawn from this incidence.

Infection and Toxaemia: The association of acute ulcers of the duodenum with burns has been long recognised (Curling, 1842) and acute gastric ulcers are occasionally found after death from acute septic infections (Hurst and Stewart, 1929). The role of chronic infections in the aetiology of peptic ulceration has been more difficult to determine although Moynihan (1912) strongly supported the view that both gastric and duodenal ulcers are secondary to some toxic or infective process.

It has already been noted that an increase in the symptoms of dyspepsia was commonly associated with the presence of a common cold or other respiratory infection. Chronic infection of the nasal sinuses was also present in three cases, two of whom suffered from a major relapse of symptoms, but as other possible precipitating factors were also present, the focal sepsis/

sepsis can only be included as one of several apparent causes of recurrence. One relapse coincided with the development of an ischio-rectal abscess (Case 22) and in another (Case 19), the ulcer was apparently prevented from healing by the presence of a pathological appendix. Appendicectomy was performed following a second attack of subacute appendicitis and the presence of a large duodenal ulcer was confirmed at operation. When this case was reinvestigated four months later, the patient was completely free of symptoms and there was now no radiological evidence of gastric or duodenal ulceration.

Fatigue and Excessive Physical Strain: Excessive fatigue and physical strain have been frequently stressed as potent influences in precipitating the symptoms of peptic ulcer (Hurst and Stewart, 1929; Jordan, 1945) and the association of the fatigue of a long journey with the recurrence of symptoms in the present series has already been noted. The earlier histories of a number of cases also showed that complications may be precipitated by prolonged mental and physical fatigue. Thus two cases of perforation (Cases 10 and 11) occurred soon after experience of a Russian Convoy, but it is important to note that there was often an appreciable interval of days or a week or two between the preceding events and the onset of acute symptoms/

symptoms. The role of fatigue appears to be more closely associated with the psychogenic group of factors than with the mechanical and chemical group, and also plays a greater part in the aetiology of duodenal ulcer than in that of gastric ulcer.

Endogenous (Ulcer Diathesis): When the possible external precipitating factors have been considered, we are left with a group of cases in whom no apparent cause can be found, and whose symptoms and remissions must be regarded as essential features in the natural history of the disease. Five of the cases of relapse which have been studied fall into this category, as their histories reveal no apparent aggravating agents.

Hurst (1920) first drew attention to the possibility of an ulcer diathesis or constitutional tendency to develop a chronic gastric or duodenal ulcer, and since the true cause of the disease is still unknown this conception remains the basis of any explanation of the aetiology. Thus Eusterman (1939) observes that all noteworthy contributors agree that peptic ulcer is not the result of a single agent, but is a product of the interaction of various agents, and that the constitutional or systemic factor is fundamentally essential. The work of Draper, Dupertuis and Caughey (1944) has suggested that the incidence of peptic ulcer may be related to the physical type of the patient but this is not supported by Jordan (1945) who states that there/

there is definitely no physical type of human being who is more prone than others to develop an ulcer. No definite relationship to physical types was found in a large series of cases of peptic ulcer in the Royal Navy (Allison and Thomas, 1941c).

Whatever may be understood by the term 'ulcer diathesis', it must be recognised that the patient with a peptic ulcer should be studied and treated as a whole and his ulcer regarded as merely an incident in the life history of the disease, or as Jordan (1941) expresses it - "the life history of ulcer can be said to end only with the life of the patient".

DISCUSSION.

1. The Royal Naval Experiment in Relation to Experience in Other Services.

In order to complete the picture of the Royal Navy's experiment in the employment of men with healed peptic ulcers it is necessary to compare the results with those of the other services in which similar schemes were carried out. It has already been noted that no comparable experiment was attempted in either of the other arms of the British Forces (Tidy, 1943; Rook, 1943) and any comparison must therefore be confined to the experience of the medical services of Dominion, Allied and other countries whose conditions and standards of service may have differed markedly from our own.

Royal Canadian Navy: The problems and conditions of service in the Royal Canadian Navy were essentially the same as those of the Royal Navy and the problem of peptic ulcer had also to be faced at an early stage of the war. In recognition of this, a special gastro-intestinal clinic was established in a Royal Canadian Naval Hospital and Lane (1944; 1945) has studied a series of 181 cases of peptic ulcer who were treated in this clinic between January, 1942 and July, 1943. The analysis of these cases was limited to those factors which were considered to be of value in determining the advisability of retaining such ratings in/

in the service. The general policy was that all cases of complicated peptic ulcer were discharged from the service, whereas all cases of uncomplicated ulcer were treated in hospital for about one month, after which convalescent leave was granted. On returning from leave they were recategorized for shore service only and were placed on lodging and provision allowance, which entailed private board and lodging outside the naval barracks. The men then attended the gastro-intestinal clinic at intervals and at these interviews hospital education regarding diet and adjustment of personal habits was supplemented and the case records were reviewed. Contact was made with the executive officers when necessary, to ensure a trial of duty where conditions of work were suitable. Under this policy it was possible to retain a certain proportion of ulcer cases in protected jobs ashore. Those who were grimly determined to carry on were found to make a maximal effort and usually succeeded under this routine while those who failed to cooperate were considered to be probably less desirable ratings whose loss was of less importance to the service. The value of the ratings with peptic ulcer was indicated by the fact that 55 per cent. of the series studied by Lane were retained in the Royal Canadian Navy and employed in a protected existence ashore. These arrangements were thus/

thus similar to the Royal Naval scheme with the exception that men were not provided for as a group and had to make their own arrangements for following a dietetic regime. In both schemes care was taken to eliminate cases of a doubtful nature but a notable point of contrast was the policy regarding cases with a history of previous complications. Such cases were invalided at once from the Royal Canadian Navy whereas in the Royal Navy over 50 per cent. of the cases employed in the special units in Northern Ireland had histories of complications. The subsequent behaviour of the latter showed that their relapse rate was no greater than that of the uncomplicated cases, but the duration of incapacity tended to be longer in the patients with a history of a previous haemorrhage or perforation. This suggests that while there may be little difference between the liability to suffer a recurrence, relapses are likely to be more severe in the complicated cases. The elimination of such cases might therefore be recommended on the grounds that they would be liable to lose more time off duty as the result of sickness than the cases whose history is uncomplicated, and thus the policy of the Royal Canadian Navy would be justified. On the other hand, Wakeley (1944) found that 44 per cent. of a series of 103 cases of perforated peptic ulcer were still serving in the Royal Navy from 9 to 20 years after operation.

A/

A possible explanation of the apparently good results in this series is the fact that the cases were all long service naval personnel who had been treated in a naval hospital under peace-time conditions, between the years 1924 and 1934. Convalescence and after treatment were more prolonged than is generally possible in the average civilian case, and the men were free from the economic worries which faced wartime servicemen, nor were they subjected to the extra strain which was the result of a rapid transition from civilian life to life in the Royal Navy under wartime conditions. In fact, they were living under the conditions of security of men who had made the Navy their permanent career, with the regular hours of work, regular meals and peace of mind which are considered so essential to the welfare of the patient with a peptic ulcer, and in addition, they represented a highly selective group compared with the general population. What is emphasized however, by this study, is the fact which has been proved in the present thesis, that selected cases of peptic ulcer can continue to give useful service in the Royal Navy, and it may well be that conditions of service in peace-time approximate more closely to the conditions under which the men were employed in the experimental scheme in Northern Ireland, apart from the diet and medical supervision.

Canadian/

Canadian Army: The peptic ulcer problem in the Canadian Army in England was studied by Urquhart, Singleton and Feasby (1941) and subsequently followed up in Canada by Feasby (1944). The majority of cases of proved peptic ulcer were discharged from the service but some attempt was made to retain a selected group of men with duodenal ulcers but it was found that only 10 per cent. of this group could carry on indefinitely after returning to duty, either in England or in Canada. Two factors were considered of importance in determining their ability to carry on - (1) willingness to continue in the service and (2) the ability to select food and environment to a certain degree. Officers and non-commissioned officers made up half of this group.

United States Navy: In the United States Navy, as in the Royal Navy, the retention of highly skilled men was of such great importance that careful consideration was given to the problem of managing the patient with peptic ulcer with a view to returning him to duty if possible. As most cases of uncomplicated ulcer amongst new recruits had symptoms prior to enlistment it was found advisable to discharge such men from the service before 6 months (later 3 months) had elapsed from the time of enlistment, otherwise the government became responsible for their continuous treatment and disability pensions (Walters and Butt, 1943). Officers and/

and men whose ulcers developed during their period of active duty were entitled to pensions and continuous treatment and presented rather a different problem. It was believed by Walters and Butt that a large majority of patients with active, chronic or recurring ulcers could be returned to active duty at sea or overseas, if surgical treatment, preferably partial gastrectomy, were to be carried out as soon as the diagnosis was established. This was done in a very small number of cases but they had not been followed up for long enough to allow any definite conclusion to be made. A collected series of 1,352 cases from a number of United States Naval Hospitals over a two year period, showed that only 8 per cent. had been treated surgically, of which 71 per cent. were returned to duty compared with 55 per cent. of those treated medically. One reason advanced for recommending early surgical treatment was that if a decision to operate is delayed too long, the patient becomes so accustomed to hospitalization that he is reluctant to return to active duty, regardless of the result of treatment. This view was not shared by Twiss and Parsonnet (1945) who considered that the majority of cases of peptic ulcer should be discharged from the service and that no patient should be considered as a candidate for limited duty unless he could tolerate a regular diet without medication and had/

had no evidence of an unstable emotional background. Monat and Carleton (1944) suggested that an average stay in hospital for a proved peptic ulcer patient should not exceed six weeks. At the end of that time the man should be surveyed either out of the service or to limited shore duty as the great frequency with which ulcer patients have a recurrence of symptoms while at sea, with increased physical and emotional stress, on regulation mess, makes it unwise to return these men to full duty. Loe and Berger (1944) stressed the importance of proper dietary facilities for patients who were retained for limited duty and did not view with optimism the performance of radical surgical operations on United States Naval Personnel with a view to returning them to duty. The plight of the ulcer patient in the Navy of the United States was also studied by Hook and Keane (1945) who found that the psychosomatic aspect of the disease was the most important from the point of view of management and if such cases were to be retained, they must be treated under a well organized plan and handled with sympathy and understanding.

The impression obtained from the published accounts is that the efforts of the United States Naval Authorities to retain men with peptic ulcer were much less successful than those of the Royal Navy and the Royal Canadian Navy. This may have been partly due to the lack of a uniform policy regarding the disposal of cases/

cases, which appeared to vary greatly from hospital to hospital.

United States Army: It had been assumed by the Army Recruiting Boards of the United States that if a man had been able to hold a job consistently for the two preceding years, he would be able to tolerate army life in spite of a history of dyspepsia, forgetting that a civilian can choose his own food but a soldier cannot do so (Chamberlin, 1942). In a series of 139 men with peptic ulcers, only 14 were considered capable of any duty. These were all men of long service and excellent training and their retention depended on ability to have a proper diet and on not having to eat in the ordinary mess (Chamberlin, 1943). It was agreed by most physicians in the United States that the soldier with a peptic ulcer was unfit for active service but Kantor (1942) considered that this principle might have to be modified if the manpower situation became more acute. Flood (1943) stressed the fact that cases who were retained in the Army should be of stable personality, because those with a neurotic temperament fare badly. Berk and Frediani(1944) considered that with few exceptions, the useful military service which soldiers with peptic ulcers contribute is more than counterbalanced by the time lost through sick call or in hospitals.

Rosenah/

Rosenah and Foltz (1945) found that it was impossible to keep ulcer patients in their own hospital detachments free of symptoms while on duty. The experiment was tried a number of times under circumstances which made it possible for men to obtain feeds between meals and to continue to take alkaline powders, but it failed in every instance. This was held to demonstrate the futility of trying to maintain these patients on duty in military units overseas. On the other hand, Goldbloom and Schildkrout (1944) reported the results of their experience during the first twelve months of an experiment designed to rehabilitate soldiers with chronic gastro-intestinal complaints. After investigation from the physical and psychiatric points of view, the men were discharged for duties in the various sections of the camp according to their training and experience, any who were originally on the complement of the station being returned to their former duties. All the men were brought regularly to the station hospital for their meals, the diet being under the control of the dieticians in the hospital. Follow-up studies were carried out in the hospital gastro-intestinal clinic and group discussions were held in which their problems were discussed in relation to their work as well as their digestive disorders. The cooperation of the unit commanders was obtained in making any necessary/

necessary readjustments in duties for individual cases. Early in the course of the experiment, it was found that the patient's attitude towards the Army, his morale and his personality were the factors which determined the successful results obtained with each patient. The main principles of this regime were thus similar to those of the Royal Naval Experiment described in this thesis, but there were important differences in the selection of cases and in the dietetic arrangements. In the Royal Naval scheme the men lived together and messed as a group but were otherwise treated as an ordinary naval mess. It was considered undesirable to create the impression that they were being treated as a group of invalids under hospital supervision, and they were therefore not followed up as hospital out-patients but were interviewed regularly by the Medical Officer in the Royal Naval Barracks or on board their own ship. By thus keeping them away from the atmosphere of Hospital, it was felt that any adverse effects of over-hospitalization might be avoided, whereas the United States cases were under the direct supervision of the hospital in which they had been investigated. The other important difference between the two experiments was that the American group was not confined to cases of proved peptic ulcer but included all types of chronic dyspepsia. Thus of the first 100 men observed by Goldbloom and Schildkrout, only 50 were cases of peptic ulcer/

ulcer while 42 were classed as "functional dyspepsia". It is not surprising to find that a large percentage of the latter had a psychoneurotic background and their progress was less well defined and was not so successful as that of the ulcer group. It was claimed however, that 70 per cent, of the total were salvable, but this estimate appears to have been unduly optimistic since it included 13 cases of peptic ulcer who were discharged from the service and when followed up in civilian life were found to have suffered from recurrent symptoms necessitating a change to lighter work. Twenty-two men were transferred to other posts and were doing full duty and it therefore seems justifiable to claim these as successful results. Thirty-five still remained in the regime, 20 of these being cases of peptic ulcer, of whom 2 were considered to require discharge from the service. Of the original 50 cases of peptic ulcer admitted to the scheme, 7 or 14 per cent. had returned to full duty and if they are added to the number remaining in the regime, it shows that 50 per cent.of the cases of peptic ulcer might be considered salvable. If the criterion of success is the ability to perform full duty according to training and rank, only the 22 per cent. transferred for duty could be considered to be successful results since there are several statements in the paper which strongly suggest that many of the men employed under the regime were not carrying out the duties for which they were trained - thus - "frequent adjustments/

adjustments in the type of duty were required until a suitable mean was obtained in which the soldier could perform adequately in some useful capacity".

These results contrast sharply with those of the Royal Naval scheme in which, over a similar period of time, the majority of the men carried out the duties for which they were trained, and in addition, no man was drafted for service in the scheme unless he was considered fit to carry out the full duties of his rank under conditions of Home Shore Service. The undesirability of retaining men who displayed psychopathic traits has already been discussed in some detail, and the subsequent progress of the few cases who were misfits in the scheme clearly showed the wisdom of excluding all doubtful cases. Goldbloom and Schildkrout also noted in their peptic ulcer group that there was a close correlation between the morale of the patients and the results obtained.

Reference has been made in the introduction to other reports from United States sources, all of which agreed that cases of peptic ulcer should generally be discharged from the armed forces unless special arrangements could be made for the retention and management of key personnel.

German Armed Forces: The problem of peptic ulcer in the German Army was recognised at an early stage of the/

the war and Teschendorf (1939) considered that a man with a gastric ulcer was unfit for active service whereas men with duodenal ulcers were considered fit for home service. Special units were formed in the German Army for men suffering from digestive disorders and Manke (1944) recommended as one of the main forms of treatment, the use of pantocain, or other local anaesthetic, mixed with a porridge of oatmeal and dried fruit and given twice a day, between meals. This was claimed to remove the fear of pain after food and so improved nutrition and facilitated healing. The method could also be applied in the unit and evidently formed one of the chief methods of treatments in the "peptic ulcer battalions", according to the history of a German Prisoner-of-War who had been a member of one of these units and who was subsequently admitted to a Royal Naval Hospital (Allison, 1945b).

The material studied by Tidow and Nekarda (1943) was from the Keil Naval Hospital in 1941-42, the cases being drawn from all the German Armed Forces but chiefly from the Navy. This study showed that peptic ulcer was the main problem and the authors considered that functional dyspepsia was less common in the German Forces than in the British Forces. Subsequent evidence after the end of the war has shown however, that functional gastro-intestinal symptoms were extremely common amongst cases referred to German psychiatrists

(Curran,/

(Curran, 1945). No reliable statistics are yet available with regard to the incidence and disposal of cases of peptic ulcer in the German Navy (Roberts, 1946), but White (1946) has made an interesting study of the incidence of upper gastrointestinal disease in 500 German Prisoners-of-War in comparison with the incidence in a similar number of American soldiers, and found no significant difference. There was however a greater variety of conditions and a larger number of more serious cases in the prisoners, which was explained by (1) the difference in the type of patient treated in station and general hospitals; (2) the relatively older age of the German soldier; and (3) the fact that men with peptic ulcers were accepted by the German Army, many having had gastric resections while in the service.

Russia: The available literature has shown that peptic ulcer was a large problem in Russia during the recent war, both in civilian and military practice, and led to the provision of special dietetic facilities in the factories for the use of workers with dyspepsia (British Medical Journal, 1944). Nikolaev (1943) found that the symptoms of peptic ulcer occurred more frequently in wartime, although the total incidence of the disease was no greater than in peacetime. This author also considered that in certain cases, peptic ulcer could not serve as a basis for exemption from war work either at the rear or at the front, thus suggesting

that/

that every effort was made to utilise the services of suitable cases. The acute symptomatology and the frequency and severity of complications presented by the wartime picture of the disease have been stressed by Kogan-Yasney (1945). With regard to working capacity after various forms of therapy, Prokofiev (1939) found no difference in invalidity between cases treated surgically and those who were treated conservatively.

Other Countries: It is interesting to find that gastric disorders were of sufficient importance in the small conscripted army of Switzerland to cause a committee of gastro-enterologists to draw up rules for the guidance of military physicians (Demole, 1941). The recommendations aimed at estimating the suitability of dyspeptics for military service and determining the best way to render them capable of such service. The following solutions were suggested:-

(1) Transfer to less active units or to auxiliary service;

(2) Additional pay to enable the dyspeptic soldier to replace meals which he could not digest, with something which met his requirements;

(3) The formation of dietetic companies in which the consumption of tobacco and alcohol would be forbidden;

(4) The stationing of the soldier in a unit near his home so that he could take his meals at home.

The latter course was considered to be the best medical solution/

solution for the dyspeptic patient, but was rarely possible from the military point of view. The first suggestion was based on the belief that the unaccustomed physical exertion combined with the change to army food is liable to upset the rhythm of digestion in recruits. It was considered that the second suggestion might lead to abuse and create difficulties, and it was therefore not carried out. With regard to the formation of dietetic companies, it was felt that it would be impossible to create the proper military spirit in groups of semi-invalids whose value as soldiers was questionable. Ulcer cases were considered to be unsuitable for long periods of military service and it was recommended that they should be re-examined and a fresh decision made after six months. Haemmerli (1941) also found that men with peptic ulcers could tolerate military life for only short periods. In cases in whom gastric disturbances developed during military service, it was usually not the army diet which caused the disorder but infectious disease or excessive physical and mental exertion and fatigue.

Most of the papers from Allied and other sources have emphasized that the most important factor in the retention of men with peptic ulcer for military service, is the morale of the individual. All the available evidence suggests that when the ulcer case continued

to/

to give useful service, the important feature was not whether he had received medical or surgical treatment, but that he had a stable personality and was anxious to remain well and to continue serving. Markoff (1943) has summed up the position with the statement that an operation does not make a gastric patient into an efficient soldier. It has already been shown that good selection was probably the reason why Wakeley (1944) found that a large proportion of cases of perforated peptic ulcer were still serving in the Royal Navy many years after operation. The results of good selection in another sphere of activity in the Royal Navy are shown by the almost negligible incidence of psychiatric disorders amongst the men of the submarine service (Curran and Guttmann, 1945). If dietetic factors were the primary cause of peptic ulcer it might be reasonably expected that service in submarines would contribute to the aetiology of the disease in the Navy, especially under wartime conditions. On the contrary, only one case in Allison and Thomas's (1941) series was serving in a submarine at the time of admission to hospital. In the present series, one man was serving in a submarine at the time of origin of his symptoms but a much wider study would require to be made before these findings could have any statistical value.

II./

II. Practical Application of Wartime Experience: Peptic Ulcer as Problem of Industrial and Social Medicine.

The experience gained in the management of cases of peptic ulcer in the armed forces should not be neglected in civilian practice in the years of peace since it has been shown that the unexpectedly high incidence of the disease in the fighting services was only a reflection of the incidence amongst the general population. In a study of civilian dyspepsia during the recent war, Jones and Pollak (1945) quote figures which suggest that nearly 200,000 men develop peptic ulcer each year, and that the number of living people in England and Wales who have suffered from peptic ulcer is around 1,500,000 or may even be higher. In the opinion of these authors, the magnitude of the problem demands further study of those factors in modern industrial life which favour peptic ulceration.

Peptic Ulcer as an Industrial Problem: It has been believed for many years that gastric disorders are more common in certain occupations but apart from an investigation into the sickness experience of London Transport workers (Hill, 1937) and Bashford and Scott's (1935) study of Post Office workers, very few extensive investigations were carried out in this country before the 1939-45 war. The last published figures of in-

invapacity amongst the Insured Population of Scotland reveal that in the year 1936-37, diseases of the digestive system accounted for 6.74 per cent. of the total days of incapacity, and gastric and duodenal ulcer accounted for 3.4 per cent. of the total incidence of chronic sickness in men between 35 and 55 years of age. The high place which digestive disorders take as a cause of sickness in industry is also shown by Massey and Pearson's (1942) study of sick absence among munition workers and by the figures of certified sickness among women in industry (Wyatt, 1945). Whitwell (1944) found that no less than 20 per cent. of the employees of a large factory were at one time or another absent from work on account of gastric disorders. It was also found that about 5 per cent. of the male employees had a peptic ulcer, this number being swelled by discharges from the Army. Nearly all of the patients with ulcer coming to the factory had a long previous history and few appeared to develop peptic ulceration as a result of industrial conditions.

Fate of Discharged Service Cases: In pointing out that dyspepsia can be profitably studied from the purely sociological standpoint, Whitwell (1944) contrasts this view with the service studies of dyspepsia, most of which confine themselves to very simple objects such as ascertaining the presence or absence of an ulcer/

ulcer and then disposing of the patient. Unfortunately for civilian doctors, they cannot dispose of their patients, and since industry has had to absorb most of the men who have been discharged from the forces on account of peptic ulcer, the problem of the dyspeptic sailor, soldier or airman was by no means solved by discharging him from the service. On the contrary, his difficulties were largely beginning and he was branded with a disability which might prevent him from obtaining the employment for which he was most suited.

It is true that the provisions of the Disabled Persons (Employment) Act, 1944, can be used for the benefit of the sufferer from peptic ulcer, but Gainsborough and Slater (1946) found that the readjustment of working conditions and social problems could rarely be dealt with satisfactorily. For many reasons it was difficult to effect a change of occupation, even though the absence of unemployment during the war should have facilitated such changes. Where an individual was highly trained he was often unwilling to try a change of occupation, despite the awareness of the necessity for a change. In some cases this was due to the risk of a lower level of earnings, and employers could not always find work for individuals for whom shift work produced difficulties. These authors considered that all the facilities of the Act should be used to the full/

full in treatment and also noted that the resettlement appeared satisfactory in the case of the few patients who accepted retraining under the Interim Scheme.
In a review of the experience of some thousands of disabled persons in Scotland during the war, Ferguson (1945) found that some disability groups returned better results than others, and among those who did well were men suffering from peptic ulcer and men whose disability was psychoneurotic in nature. Garbat (1946) has also recently discussed the problem of the returned soldier with peptic ulcer in the United States where the difficulties are probably even greater than in this country.

Effect of Industrial Conditions on the Dyspeptic Patient:

Whitwell (1944) found that changes of shift, long hours and fatigue were prominent as apparent causes of dyspeptic symptoms. The employee with a peptic ulcer was especially liable to be upset by changes of shift, and one man had a small haematemesis on three occasions on attempting to change to night shift work. New employees often suffered from nausea and anorexia due to the smell of hot oil or paraffin and some of them vomited on first entering the factory, but these symptoms could often be inhibited if the smell was disguised. Ulcer patients were particularly anxious about chemicals in use in the factory, lest they upset their/

their ulcers. Home and dietetic factors were also investigated and it was found that many workers were in the habit of having no breakfast before setting out for the factory, but by 9 a.m. when trolleys came round with tea and buns, the appetite had reappeared. Many people did not like canteen food and so their main meal was at night, while others said they were too tired to eat a big meal at midday but could manage buns and tea. Many said they vomited in the mornings, and this appeared to be a not unusual stress symptom.

Since new employees are very liable to develop symptoms as the result of their new surroundings, Whitwell considers that they should be visited regularly by the labour manager during their anxious initiation period. That little could be done however, for most of the cases seen in industry is evident from this author's statement that it was depressing to view all this indigestion and to be able to do little about it.

The Management of the Worker with Peptic Ulcer:
The arrangements whereby large numbers of ex-service and disabled personnel are being provided with vocational training should afford ample opportunities for studying and improving the lot of the worker with a peptic ulcer. In many of the Government's Vocational Training Centres hostel facilities are available for trainees/

trainees who are away from home and conditions are thus similar to those under which the Royal Naval Experiment in the rehabilitation of peptic ulcer cases was carried out, and there is abundant evidence to suggest that such a scheme would be of value in selected training centres. Thus Tuke (1946) found in a training centre of 600 men, that a number of ex-service cases of peptic ulcer were unable to take the food supplied in their hostel without suffering from a recurrence of symptoms. No facilities were available for the provision of a lighter diet or for a more suitable regulation of meals in such cases.

It would be of great value if a regime of rehabilitation for dyspeptic trainees could be instituted so that the time spent in training a man for a new occupation or in refreshing him for his old one might also be utilized for educating him in the care and understanding of his peptic ulcer. This was found to be practicable in the Royal Naval Scheme during the stage of rehabilitation in the hospital centre. It should not be difficult however, to arrange a programme of education similar to that outlined by Ingelfinger and Moss (1945) which could be carried out during the early stages of vocational training when the relationship of the disease to work and environment might be discussed and any difficulties anticipated. This too is the

stage/

stage when cooperation is most necessary between the medical officer and those responsible for the training and employment of the patient.

Since the duration of stay in a vocational training centre is limited, the necessity for making special arrangements for the benefit of a comparatively small group of patients may appear to be exaggerated, but this is not the case if such a scheme is considered as part of a long term policy in preventive and social medicine. The Report of the Medical Advisory Committee (Scotland) on Rehabilitation (1946) points out that the principal causes of chronic incapacity are medical rather than surgical, and that in the treatment of diseases normally dealt with by the physician, the scope of rehabilitation is as yet imperfectly appreciated. It is also emphasized in this report that in the treatment of diabetes, peptic ulcer and other alimentary disorders, attention must be paid to diet, meal times, hours of work, and the stresses and strains to which the patient may be subjected. Rehabilitation may thus involve some readjustment of mental outlook and, in some cases a change of occupation. The real long term policy must be applied however, not only in the training centres which are fulfilling a temporary need made necessary by the war, but as a part of the industrial health organization in the factories and workshops, in which the industrial medical officer,

the/

the factory nurse, the executive staff, the general practitioner and the worker may each play a part in working towards the economic recovery of the Nation.

Medical Organization in the Factory: The medical supervision of dyspeptic employees should present no difficulties since most large industrial firms now employ either full-time or part-time medical officers. Whitwell (1944) points out that the works' doctor has a knowledge of many of the essential factors which can be assessed as possible aggravating causes of dyspepsia, and he is thus in a happier position than the outside doctor in that he can to some extent, change the worker's environment should some modification be required. The industrial nurse can also help in combating the problem of dyspepsia in the factory by her contact and supervision of the employees and can also greatly add to the knowledge of the subject by her observations. She could also carry out much of the routine work such as the regular weighing of patients and the interviewing of cases requiring a minimum of supervision during periods of remission. Her services would perhaps be of greatest value in the management of non-ulcer cases such as those precipitated by fatigue, which Whitwell has termed "stress dyspepsia", and whose chief requirement is reassurance, especially if they are recent recruits to factory work.

Experience/

Experience of the problem of peptic ulcer in the Royal Navy has shown that the most important feature in the management of the subject of this disease should be a regular interview with the doctor. This is of great value in allowing the patient to discuss any problems of health, work or environment and is most important when symptoms of anxiety or any abnormal personality traits are present. An hour or so on one or two days a week should be set aside for this purpose and could easily be arranged in most factories without interfering with working routine. Group discussions or lectures from time to time would also be of value in treatment, although it is felt that this method is more useful in service cases than in the less disciplined and perhaps more human atmosphere of civilian medical practice.

Dietetic Arrangements for Factory Workers: The necessity for dieting in cases of ulcer dyspepsia still occupies such a prominent place in the minds of doctors and patients that other important factors in the management of the disease are liable to be neglected. It is hoped however, that the day is past when the patient with a peptic ulcer is handed a prescription for alkaline powders together with a printed diet sheet which he can have little hope of following or even attempting, and so continues to exist on a restricted diet of milk and fish/

fish until he returns to his doctor a few months later in a state of malnutrition and vitamin deficiency. In addition, he has by now more than likely developed a dislike for certain articles of food which he believes are the cause of his dyspepsia, and may actually have developed a conditioned reflex towards such foods (Allison and Thomas, 1941).

The modern dietetic principles in the treatment of peptic ulcer are now clearly established (Dunlop, 1942; Allison, 1945a ; Davidson and Anderson, 1947) and experience in the Royal Navy's experiment in the rehabilitation of peptic ulcer cases showed that it is not difficult to put these principles into practice. It should therefore be comparatively easy to employ the same principles in catering for the needs of the dyspeptic worker in industrial canteens, or a communal diet centre might be established which could cater for all dyspeptic employees in the area. Such arrangements are firmly established in Russian industrial life and it is known that as long ago as 1935, 600,000 workers in the U.S.S.R. were receiving special diets in their canteens (Lancet, 1946).

The canteen should be able to supply the main meals during the ordinary working day as well as light snacks such as milk and biscuits for consumption between the main meals. A most important service would be/

be the provision of meals for workers on night shift for whom it appears to be more essential to have tastily served and appetizing food (Whitwell, 1945). Another important function of the dietetic canteen might also be the education of the patients and their families in the elementary principles of dietetics and the preparation of a suitable diet, since experience in general practice has shown that knowledge of even the most elementary facts of food preparation is often woefully lacking in working class households.

Time for Meals: Of equal importance to the adequate preparation of food is the allowance of sufficient time to eat, and any saving of time through eating in the canteen instead of at home should not be an excuse for a reduction in the meal hours. There should also be regular intervals for rest and relaxation during working hours when the extra feeds can be consumed, and facilities should be such that these snacks can be supplied in the workshop during the rest periods.

Additional Cost: The extra expense involved in providing such facilities would be negligible in catering for large numbers, and in any case the cost of the meals would be met by the workers themselves and would not be met out of public funds as was the case in the Royal Navy. Even if the increased cost over the price of ordinary canteen food were to be subsidized by the employers or from public funds, it would be compensated for/

for by the reduced incapacity for work and the maintenance of production, as well as by the potential saving in sickness insurance benefits, all of which are important considerations during the present economic situation.

Social Aspects of Peptic Ulcer: The services of the hospital almoner can often be of great help to the patient with a peptic ulcer and a similar service could be carried on in the industrial sphere. A close liaison between the industrial medical officer and the executive industrial staff is essential to the management of the human side of employment (Whitwell, 1944) which includes consideration of such factors as fatigue, overtime, shift work, breaks for rest and refreshment during shifts, and the general welfare of the workers. Interest in the latter should not necessarily end with the working day but can be extended to the environment outside the factory. Much could be done through the judicious employment of trained welfare workers and by the organization of recreational facilities for the worker and his family, while advice and practical help might be given in times of domestic stress. In short, the disease must be treated as a social and a national problem rather than as a purely medical one. The importance of the social factors in peptic ulceration is now clearly recognized (Lancet, 1944) and this is to a large extent due to the work of Illingworth and his colleagues/

colleagues in Glasgow where a peptic ulcer clinic has been established in order to study this problem of social medicine (Illingworth and Scott, 1944; Jamieson, 1947).

Role of the General Practitioner: In any properly planned industrial health service the general practitioner should be the key man who is best fitted to deal with many of the social aspects of disease. He could advise on the necessity of home help or the need for the services of the welfare worker and in many cases continue to act as the family counsellor and friend as well as medical adviser. The work of the industrial medical officer and the welfare worker should thus be complementary to that of the family doctor and a close liaison between them could only result in the improvement of the patient and his environment. This applies of course not only to the problem of peptic ulceration but to the whole field of social and industrial medicine. The aim is to view the patient and his environment as one and not merely to consider him as an individual suffering from a disease.

The Present Position: There are signs that a wider interest is now being taken in the dietetic needs of the dyspeptic in industry (Lancet, 1946), but to be of any real value the problem should be tackled on a national scale and with the advent of a National Health Service there is no reason why this should not be done.

A/

A start might be made by the establishment of more peptic ulcer clinics with a view to studying the social factors of the disease, on the lines followed by Illingworth and his colleagues in the West of Scotland. The follow-up clinic, through the work of its almoner, can do much to stimulate the interest of employees and there would appear to be ample scope for the establishment of a scheme of rehabilitation and supervision for peptic ulcer cases in Government Vocational Training Centres, in the factories controlled by the Ministry of Supply and in the mines of the National Coal Board. Individual interest in such developments is now being shown by one or two industrial firms in Northern Ireland as the result of the knowledge gained from the Royal Naval Experiment (Allison, 1946).

Since we are still ignorant of the ultimate cause of peptic ulcer, there is unlimited scope for the investigation of the social and industrial aspects of the disease and as Morris and Titmuss (1944) conclude - "with properly organized field studies there is no reason why exact observation should not replace much that is at present guesswork".

SUMMARY AND CONCLUSIONS.

Digestive disorders, and peptic ulcer in particular, proved to be one of the chief medical problems in the armed forces of both combatant and neutral countries, during the 1939-45 War.

The wastage of manpower on account of chronic dyspepsia was sufficiently serious to cause the military authorities of some of the combatant nations to consider measures which might enable cases of peptic ulcer to be retained for limited military service. Although most of the attempts to retain such cases were unsuccessful, it was a common experience that a proportion of men continued to give good service provided they could be granted special facilities with regard to their diet and working conditions.

In the Royal Navy, peptic ulcer was one of the three chief causes of invaliding during the recent war, and this constant loss of skilled men caused the Admiralty to consider "the employment of invalided men or men who would otherwise have been invalided, in particular healed gastric and duodenal ulcer cases, on maintenance work and manning harbour servicing craft at the three Home Ports and the larger out-ports."

In 1943, special dietetic facilities were established in two of the Royal Naval Depots in order to accommodate the increasing numbers of men who were being referred from hospital with the diagnosis of peptic/

peptic ulcer, and the recommendation for a period of home shore service. These arrangements could only be of a temporary nature, and while they did much to ease the lot of the ulcer cases, difficulties arose through the lack of suitable employment for many skilled men and the absence of a uniform policy in the selection of cases.

In 1944, an experimental scheme for the rehabilitation and employment of cases of healed peptic ulcer was established in which the following conditions were fulfilled:-

(1) Only proved cases of peptic ulceration were selected for employment in the scheme.

(2) All were fully trained and highly skilled men whose services were of value to the Royal Navy, and who were willing to continue serving.

(3) Every man was employed in his proper category according to his training and experience; casual or makeshift work was avoided and a full day's work was carried out.

(4) The men lived together and were provided for as a single group and special arrangements were made for their medical and dietetic supervision.

In all, 70 men were employed in the scheme and were personally observed over a period of twelve months. At the end of this period 68.5 per cent. of the cases showed no evidence of active peptic ulceration, although they were not necessarily free from symptoms. During the period of observation 43 per cent. suffered from a recurrence of symptoms necessitating some loss of time off duty.

Studies/

Studies of cases of peptic ulcer in the armed forces have shown that the clinical picture is often less well defined than might be supposed from the usual textbook description of the disease. Typical symptoms of gastro-duodenal dyspepsia are not necessarily associated with the presence of demonstrable ulceration, while an active ulcer may occur with an atypical history.

Observation of the cases described in this thesis and of other cases in the Royal Navy has suggested that the disease may show three main clinical pictures. The most common is the case with the typical history of attacks of post-prandial pain, relieved by food and alkalis, and with remissions of variable length between the attacks. The history is usually of long standing, often dating from an early age, and complications may or may not occur. Another well recognised type is that in which few or no symptoms occur until the onset of a perforation or haemorrhage. Such a patient may then remain well until the occurrence of a further complication. It has been widely believed in the past that the prognosis after perforation is better than in any other form of peptic ulcer. This view is not supported by recent statistical studies and the histories of many cases in the Royal Navy have confirmed the fact that symptoms of dyspepsia commonly recur relatively soon after a perforation. There appears to be however, a small group of cases in whom a chronic ulcer may be present/

present in the absence of symptoms, the lesion remaining silent until the onset of a complication.

The third group consists of patients who are seldom free from dyspepsia and whose histories reveal no evidence of any remissions. Abnormal personality traits, usually of an obsessional type, are common in this type of case and the presence of an active peptic ulcer may be overlooked if psychoneurotic features are well marked.

The results of the experiment have clearly shown that it was possible to retain men with healed peptic ulcers for useful work in the Royal Navy, while under medical supervision and dietetic control. Although relapses were not entirely prevented, it is considered that their severity was reduced and many men were able to continue on duty in spite of the presence of symptoms. It has also been shown that many patients do not necessarily remain free from dyspepsia even although their ulcers have apparently healed.

The success of such an experiment depends on the careful selection of cases, and only those who are of stable personality and of good morale should be considered. Cases of doubtful morale and those who are unwilling to cooperate are likely to break down rapidly and may also have an adverse effect on the other patients.

Although dietetic control still remains the basis of any regime for the management of cases of peptic ulcer,/

ulcer, even greater attention must be paid to the many other factors which may precipitate a recurrence of symptoms. While the regular routine of the regime greatly benefitted many of the Royal Naval cases, the most important single feature of the scheme was undoubtedly the regular interview with the medical officer, when any problems of health or environment could be discussed.

In the management of this disease, the patient and his environment must be viewed as a whole and the ulcer regarded as merely an incident in the natural history of the case. If such a view is taken, there is abundant scope for the application of wartime experience to the peacetime problem of dyspepsia in industry or on a national scale as a problem of social medicine.

In conclusion, it may be appropriate to quote a leading article from the British Medical Journal (1943) which states - "To separate the ulcer patient from his diathesis is like severing the fisherman from his soul, and until we learn some new secret of Nature we must be content to try to teach the patient how best to live at peace with his ulcer - and to do this he must probably learn how to live at peace with himself." If the world as a whole were to attain this last ideal peptic ulcer might no longer be a problem to the medical profession.

Acknowledgments are due to the Medical Director-General of the Navy for permission to submit this thesis, and to Surgeon Captain R.S. Allison, V.D., R.N.V.R. for the advice and encouragement which made this study possible. Thanks for advice are also due to Surgeon Captain Desmond Curran, R.N.V.R., Consultant in Psychological Medicine to the Royal Navy, and to Surgeon Commander J.A. Fraser Roberts, R.N.V.R., Consultant in Medical Statistics. Lastly, it has to be acknowledged that the experiment described in this thesis was made practicable through the personal interest of Admiral Sir Max Horton, G.C.B., D.S.O., formerly Commander-in-Chief, Western Approaches, and Captain G.W.G. Simpson, C.B.E., R.N., formerly Commodore (D), Western Approaches.

REFERENCES.

1. Abercrombie, G.F. (1944): Report on Special Diet Mess at the Royal Naval Barracks, Devonport, with Particular Reference to the Manning Situation.

2. Abrahamson, E.M. (1945): Amer. J. dig. Dis., 12, 379.

3. Allison, R.S. (1943a): Proc. Ass. Phys., Great Britain and Ireland, Quart. J. Med., N. Series. 12, 260.

4. Allison, R.S. (1943b): "The Sea Diseases," London.

5. Allison, R.S. (1945a): Nursing Mirror, 82, 5, 21, 39.

6. Allison, R.S. (1945b): Personal Communication.

7. Allison, R.S. (1946): Personal Communication.

8. Allison, R.S., and Thomas, A.R. (1941a): Lancet, 1, 565.

9. Allison, R.S., and Thomas, A.R. (1941b): Lancet, 1, 596.

10. Allison, R.S., and Thomas, A.R. (1941c): Unpublished.

11. Alvarez, W.C. (1944a): J. Amer. med. Ass. 125,903.

12. Alvarez, W.C. (1944b): "Nervousness, Indigestion, and Pain," New York and London.

13. Alvarez, W.C.(1946): Quoted in Editorial, Gastro-enterology, 6, 216.

14. Bashford, H.H., and Scott, W.L. (1935): Lancet, 2, 710.

15. Bell, J.R. (1922): Guy's Hosp. Rep., 72, 303.

16. Bennett, T.I., and Ryle, J.A. (1921): Guy's Hosp. Rep., 71, 286.

17. Berk, J.E., and Frediani, A.W. (1944): Gastro-enterology, 3, 435.

18. Black, J.M. (1933): Brit.med. J., 2, 290.

19. Bockus, H.L. (1943): "Gastroenterology," Vol. 2., Philadelphia.

20./

20. Boles, R.S. (1942): Amer. J. dig. Dis., 9, 241.

21. Brit. med. J.,(1940): 2, 836.

22. Brit. med. J. (1943): 1, 479.

23. Brit. med. J.(1944) : 2, 665.

24. Brockbank, W. (1942): Lancet, 1, 39.

25. Bruhl, W. (1942): Klin. Wschr., 21, 951.
Abstr.: Bull. War Med., (1943): 3, 338.

26. Burdett, J.H.: Statistical Report of the Health of the Navy for the Year 1931, London.

27. Chamberlin, D.T. (1942): Amer. J. dig. Dis., 9, 245.

28. Chamberlin, D.T. (1943): Sth. med. J., 36, 523.

29. Clark, W.E.L., Beattie, J., Riddoch, G., and Dott, N.M. (1938): "The Hypothalamus," Edinburgh.

30. Conybeare, J.J. (1943): Guy's Hosp. Gaz., 57, 188.

31. Curling, T.B. (1842): Med. Chir. Trans., 25, 260.

32. Curran, D. (1945): Personal Communication.

33. Curran, D., and Guttmann, E. (1945): "Psychological Medicine," 2nd. Edit., Edinburgh.

34. Cushing, H. (1932): Surg. Gynec. Obstet., 55, 1.

35. Davidson, L.S.P., and Anderson, I.A.(1947): "A Textbook of Dietetics," 2nd Edit., London.

36. Davies, D.T., and Wilson, A.T.M. (1937): Lancet, 2, 1353.

37. Davies, D.T., and Wilson, A.T.M. (1939): Lancet, 2, 723.

38. Demole, M. (1941): Helv. med. acta., 8, 722.
Abstr.: War Med., (1943): 3, 669.

39. Department of Health for Scotland (1939): Seventh Report on Incapacitating Sickness in the Insured Population of Scotland, H.M.S.O., Edinburgh.

40. Douthwaite, A.H. (1947): Brit. med. J., 2, 43.

41. Draper, G., Dupertuis, C.W., and Caughey, J.L. Jr. (1944): "Human Constitution in Clinical Medicine," New York.

42. Dudley, S.F. (1941): Proc. R. Soc. Med., 34, 401.

43. Dunlop, D.M. (1942): "Edinburgh Post-Graduate Lectures in Medicine," Vol. 2, Edinburgh.

44. Dunlop, D.M., Davidson, L.S.P., and McNee, J.W. (1946): "Textbook of Medical Treatment, 4th Edit., Edinburgh.

45. Dunn, W.H. (1942): War Med., 2, 967.

46. Edwards, J.T.R. (1946): Brit. med. J., 2, 711.

47. Edwards, H., and Copeman, W.S.C. (1943): Brit. med. J., 2, 640.

48. Ehrenfeld, A.B., and Sturtevant, M. (1941): Amer. J. med. Sc. 201, 81.

49. Ehrmann, R. (1947): Rev. Gastroenterology, 14, 89.

50. Einhorn, M. (1930): Amer. J. med. Sc., 179, 259.

51. Eusterman, G.B. (1939): J. med. Soc. N.J., 36, 369.

52. Evensen, O.K. (1942): Acta. med. scand., Supp., 126, 58.

53. Feasby, W.R. (1944): War Med., 6, 300.

54. Ferguson, T.(1945): Edinb. med. J., N.S., 52, 252.

55. Fletcher, E.T.D. (1942): J.R. Army Med. Cps., 78, 274.

56. Flood, C.A.(1943): War Med., 3, 160.

57. Forbes, H.S. (1944): J.R. nav. med. Serv., 30, 206.

58. Forty, F. (1946): Brit. med. J., 1, 790.

59. Gainsborough, H. and Slater, E. (1946): Brit. med. J., 2, 253.

60. Garbat, A.L. (1946): N.Y. St. J. Med., 46, 894.

61. Géronne, A. (1943): Dtsch. med. Wschr., 69, 121. Abstr.: Bull. War. Med.,(1943): 4, 39.

62. Gilbert, J.A.L., and Dunlop, D.M. (1947): Brit. med. J., 2, 330.

63. Gill, A.M. (1947): Lancet, 1, 291.

64. Gill, A.M., Berridge, F.R., and Jones, R.A. (1942): Lancet, 1, 727.

65. Gmeiner, G., (1941): Dtsch. Militärarzt., 6, 65. Abstr.: Bull. War Med., (1941): 2, 125.

66. Goldbloom, A.A., and Schildkrout, H. (1944): War Med., 6, 24.

67. Graham, J.G., and Kerr, J.D.C. (1941): Brit. med. J., 1, 473.

68. Greenwood, M. (1944): Royal Navy. An Analysis of Invalidings due to Disease and Deaths due to Disease, 1934-1943. Admiralty, London.

69. Haemmerli, A. (1941): Helv. med. acta., 8, 691. Abstr.: War Med., (1943): 3, 668.

70. Harrison, C., and Cooper, F.W. Jr. (1942): Ann. Surg., 116, 194.

71. Held, I.W. (1942): Med. Clin. N. Amer., 126, 645.

72. Henkel, K. (1942): Münch. med. Wschr., 89, 599. Abstr.: Bull. War Med., (1942): 3, 219.

73. Hill, A.B. (1937): Industrial Health Research Board, Report No.79, London.

74. Hill, L.C. (1943): Lancet, 1, 452.

75. Hinds-Howell, C.A. (1941): Brit. med. J., 2, 473.

76. Hinds-Howell, C.A. (1942): Brit. med. J., 1, 692.

77. Hinton, J.W. (1933): Amer. J. Surg., 20, 102.

78. History of the Great War (1931): Medical Services. Casualties and Medical Statistics of the Great War, London.

79. Hook, F.R., and Keane, R.H. (1945): U.S. nav. med. Bull., 44, 519.

80. Horder, Lord (1946): "British Encyclopaedia of Medical Practice, Medical Progress, 1946," London.

81. Houston, W. (1946): Brit. med. J., 2, 221.

82. Hurst, A.F. (1920): Brit. med. J., 1, 559.

83. Hurst, A.F. (1941): Amer. J. dig. Dis., 8, 321.

84. Hurst, A.F. (1944): "Medical Diseases of War," 4th Edit., London.

85. Hurst, A.F. (1946): Section on Diseases of the Digestive System, "A Textbook of the Practice of Medicine," edited by F.W. Price, 7th Edit., London.

86. Hurst, A.F., and Stewart, M.J. (1929): "Gastric and Duodenal Ulcer," London.

87. Hutchison, J.H. (1941): Brit. med. J., 2, 78.

88. Illingworth, C.F.W. (1945): Edinb. med. J., N.S., 52, 119.

89. Illingworth, C.F.W. (1947): Practitioner, 158, 24.

90. Illingworth, C.F.W., and Scott, L.D.W. (1944): Trans. R. med. chir. Soc. Glasg., 40, 1.

91. Illingworth, C.F.W., Scott, L.D.W., and Jamieson, R.A. (1944a): Brit. med. J., 2, 617.

92. Illingworth, C.F.W., Scott, L.D.W., and Jamieson, R.A. (1944b): Brit. med. J., 2, 655.

93. Illingworth, C.F.W., Scott, L.D.W., and Jamieson, R.A. (1946): Brit. med. J., 1, 787.

94. Ingelfinger, F.J., and Moss, R.E. (1945): Med. Clin. N. Amer., 29, 1162.

95. Jamieson, R.A. (1947): Brit. med. J., 2, 289.

96. Jamieson, R.A., Illingworth, C.F.W., and Scott, L.D.W. (1946): Brit. med. J., 2, 287.

97. Jennings, D. (1940): Lancet, 1, 395.

98. Jones, F.A., and Pollak, H. (1945): Brit. med. J., 2, 797.

99. Jordan, S.M. (1941): Surg. Clin. N. Amer., 21, 665.

100. Jordan, S.M. (1945): N.Y. St. J. Med., 45, 505.

101. Kalk, H. (1943): Dtsch. med. Wschr., 69, 559. Abstr.: Bull. War Med., (1943-44): 4, 408.

102. Kantor, J.L. (1942): J. Amer. med. Ass., 120, 254.

103. Kirk, R.C. (1943): Amer. J. dig. Dis., 10, 411.

104./

104. Kogan-Yasney, V.M. (1945): Amer. Rev. Sov. Med., 2, 233.

105. Lancet, (1942): 2, 548.

106. Lancet, (1944): 2, 858.

107. Lancet, (1946): 1, 26.

108. Lane, R.A.G. (1944): Canad. med. Ass. J., 50, 353.

109. Lane, R.A.G. (1945): J.R. nav. med. Serv., 31, 106.

110. Loe, R.H., and Berger, E.H. (1944): U.S. nav. med. Bull., 43, 450.

111. Logan, V.W., and Bransford, P.W. (1943): Ann. int. Med., 18, 929.

112. Love, H.R. (1943): Med. J. Australia, 2, 101.

113. Lowdon, A.G.R. (1947): Honyman Gillespie Lecture, Edinburgh.

114. MacNab, G.R. (1943): J.R. Army med. Cps., 80, 280.

115. Manke, R.(1944): Münch. med. Wschr., 91, 168. Abstr.: Bull. War Med., (1945): 5, 463.

116. Markoff, N. (1943): Schweiz. med. Wschr., 73, 157. Abstr.: Bull. War. Med., (1943): 3, 678.

117. Massey, A., and Pearson, R.C.M. (1942): Brit. med. J., 2, 694.

118. Metz, E. (1941): Dtsch. Militärarzt., 6, 677. Abstr.: Bull. War Med., (1942): 2, 496.

119. Ministries of Food and Health (1943): "Diets for Patients with Ulcers of the Stomach and Duodenum," London.

120. Monat, H.A., and Carleton, W.T. (1944): U.S. nav. med. Bull., 43, 459.

121. Montgomery, R. (1942): J.R. Army med. Cps., 79,226.

122. Morley, J.(1946): Edinb. med. J., N.S., 53, 273.

123. Morris, H. (1940): Brit. med. J., 2, 235.

124. Morris, J.N., and Titmuss, R.M. (1944); Lancet, 2, 841.

125./

125. Moynihan, B.G.A. (1912): "Duodenal Ulcer," London.

126. Naval Medical History of the War, Admiralty, London.

127. Nicol, B.M. (1939): Lancet, 2, 881.

128. Nikolaev, P.N. (1943): Klin. med. Mosk., 21(3), 3. Translation in abstract supplied by Librarian, R. Soc. Med.

129. Ogilvie, W.H. (1944): Brit. med. J., 2, 767.

130. Ogilvie, W.H. (1945): "British Encyclopaedia of Medical Practice," Interim Supplement 35, London.

131. Palmer, W.L. (1942): J. Amer. med. Ass., 119, 1155.

132. Payne, R.T., and Newman, C.,(1940): Brit. Med. J., 2, 819.

133. Pincus, I.J. (1943): Sth. med. J., 36, 284.

134. Prewer, R.R. (1945): J. ment. Sc., 91, 481.

135. Prokofiev, N.N. (1939): Khirurgiya, 8, 87. Abstr.: Zbl. ges. Chir., (1940): 96, 581. Translation of abstract supplied by Librarian, R. Soc. Med.

136. Rae, J.W. (1940): "Medical Officer's Journal," H.M.S. "Scott."

137. Raimondi, P.J., and Collen, M.F. (1946): Gastroenterology, 6, 176.

138. Rehabilitation. The Report of the Medical Advisory Committee (Scotland) (1946), H.M.S.O. Edinburgh.

139. Riley, I.D. (1942): Lancet, 2, 485.

140. Rivers, A.B., and Ferreira, A.E.M. (1938): J. Amer. med. Ass., 110, 2132.

141. Roberts, J.A.F. (1946): Personal Communication.

142. Rook, A.F. (1943): Lancet, 1, 733.

143. Rosenah, B.D., and Foltz, L.M. (1945): Gastro-enterology, 4, 213.

144. Ross, T.A. (1937): "The Common Neuroses," London.

145. Rush, A. (1943): J. Amer. med. Ass,, 123, 389.

146. Ryle, J.A. (1932): Lancet, 1, 327.

147. Ryle, J.A. (1936): "The Natural History of Disease," London.

148. Saffley, R. (1941): Brit. J. Radiol., 14, 96.

149. Sällström, T. (1945): Acta. med. scand., 120, 288.

150. Sällström, T. (1945b): Acta. med. scand., 121, 369.

151. Schindler, R. (1942): War Med., 2, 263.

152. Short, J.R. (1942): Lancet, 1, 429.

153. Slany, A. (1942): Wien, klin. Wschr., 55, 171. Abstr.: Bull. War. Med., (1942): 3, 219.

154. Smellie, J.M. (1942): Lancet, 1, 322.

155. Spicer, C.C., Stewart, D.N., and Winser, D.M. de R. (1944): Lancet, 1, 14.

156. Spillane, J.D. (1941): Brit. med. J., 1, 333.

157. Stephenson, G.V., and Cameron, K. (1943): Brit. med. J., 2, 603.

158. Stewart, D.N., and Winser, D.M. de R. (1942): Lancet, 1, 259.

159. Teschendorf, W. (1939): Dtsch. med. Wschr., 65, 1845. Abstr.: Bull. War Med., (1940): 1, 31.

160. Thomas, H.M. Jr. (1943): Sth. med. J., 36, 287.

161. Thompson, W.L. (1939): J. Amer. med. Ass., 113, 2015.

162. Tidow, R., and Nekarda, O. (1943): Dtsch. med. Wschr., 69, 171. Abstr.: Bull. War Med., (1943): 4, 38.

163. Tidy, H.L. (1941): Proc. R. Soc. Med., 34, 411.

164. Tidy, H.L. (1943): Brit. med. J., 2, 473.

165. Tidy, H.L. (1944a): Brit. med. J., 1, 677.

166. Tidy, H.L. (1944b): "Medical Annual," Bristol and London.

167./

167. Tidy, H.L. (1945a): "Synopsis of Medicine," 8th Edit., Bristol and London.

168. Tidy, H.L. (1945b): Brit. med. J., 1, 319.

169. Tooth, G. (1944): Brit. med. J., 1, 358.

170. Tuke, A.L.S. (1946): Personal Communication.

171. Twiss, J.R., and Parsonnet, E.V. (1945): J. Amer. med. Ass., 129, 857.

172. Urquhart, R.W.I., Singleton, A.C., and Feasby, W.R. (1941): Canad. med. Ass. J., 45, 391.

173. Wade, H.J. (1942): Lancet, 2, 636.

174. Wade, H.J. (1943): J.R. nav. med. Serv., 29, 136.

175. Wakeley, C.P.G. (1944): Lancet, 1, 11.

176. Walters, W., and Butt, H.R. (1943): Ann. Surg., 118, 489.

177. Weiss, E., and English, O.S. (1943): "Psychosomatic Medicine," Philadelphia.

178. White, P.E. (1946): Milit. Surg., 98, 131.

179. Whitwell, G.P.B. (1944): Lancet, 2, 449.

180. Whitwell, G.P.B. (1945): Nursing Mirror, 81, i. (Sept. 29th).

181. Wilkie, D.P.D. (1927): Lancet, 2, 1228.

182. Willcox, P.H. (1940): Brit. med. J., 1, 1008.

183. Wilson, A.K. (1942): Lancet, 1, 335.

184. Wilson, A.T.M. (1939): British J. med. Psychol., 18, 112.

185. Wolf, S., and Wolff, H.G. (1942): J. Amer. med. Ass., 120, 670.

186. Wolf, S. and Wolff, H.G. (1943a): Amer. J. dig. Dis., 10, 55.

187. Wolf, S. and Wolff, H.G. (1943b): "Human Gastric Function," New York.

188. Wolfert, W.G. (1937): Med. Rec., 146, 519.

189./

189. Wood, W.Q. (1945): Edinb. med. J., N.S., 52, 433.

190. Wright, S. (1945): "Applied Physiology," 8th Edit., London.

191. Wyatt, S. (1945): Industrial Health Research Board, Report No.86, London.

192. Zetzel, L. (1944): Gastroenterology, 3, 472.

APPENDIX.

I. PLATES I to XII: Illustrations of Hospital Rehabilitation Centre; Special Diet Mess; and Examples of Work Performed by the Men Employed in the Experiment.

II. SAMPLE DIET SHEETS: (a) Diets Used in Treatment of Cases of Peptic Ulcer in Hospital.

(b) Examples of Diet Supplied in the Special Diet Messes at Belfast and Londonderry.

III. SAMPLE OF RECORD SHEET USED FOR EACH PATIENT.

IV. EXAMPLE OF ACTUAL WEEKLY MEAL RECORDS FROM THE SPECIAL DIET MESS AT BELFAST.

HOSPITAL REHABILITATION CENTRE,

R.N. AUXILIARY HOSPITAL, BARROW GURNEY.

PLATE 1.

Gastric Rehabilitation Ward, R.N. Auxiliary Hospital Barrow Gurney.

PLATE II.

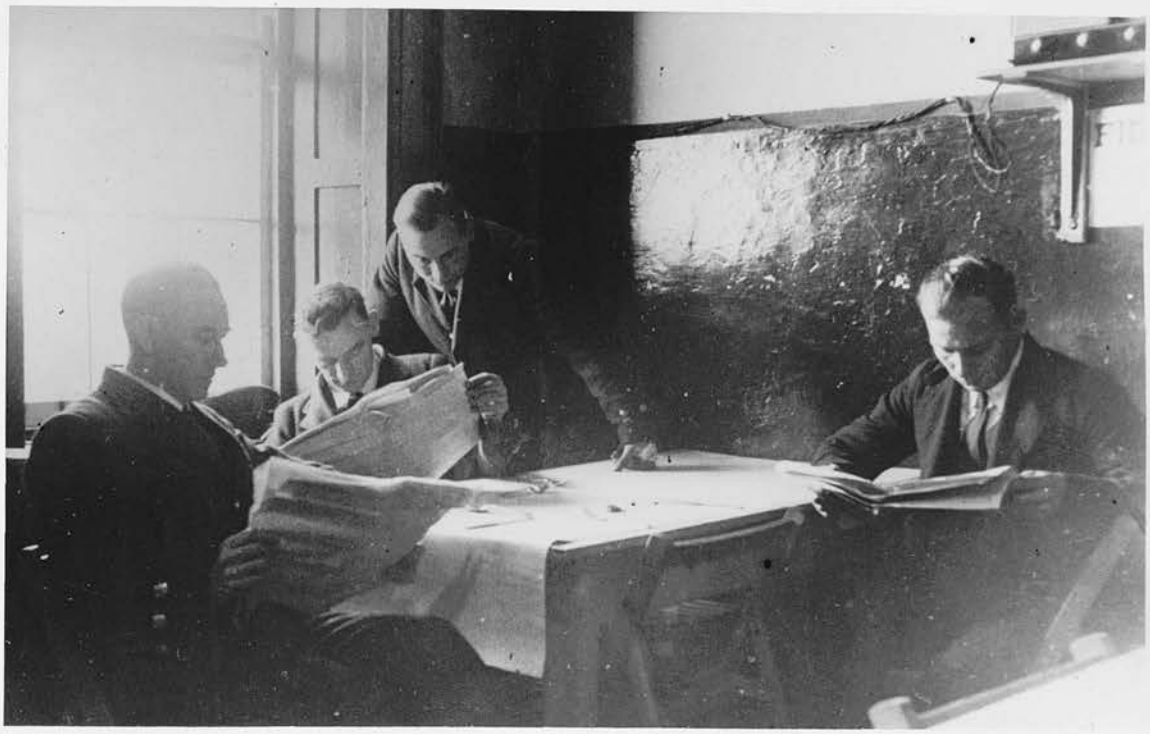
Rehabilitation at R.N. Auxiliary Hospital, Barrow Gurney.

ACCOMMODATION AVAILABLE FOR CASES OF HEALED PEPTIC ULCER IN THE ROYAL NAVAL BARRACKS, LONDONDERRY.

PLATE III.

Special Diet Block, R.N. Barracks, Londonderry.

PLATE IV.



Chief Petty Officers' and Petty Officers' Mess,
in the Special Diet Block, R.N. Barracks,
Londonderry.

PLATE V.

Dormitory for Junior Ratings, Special Diet Block, R.N.B., Londonderry.

PLATE VI.

Galley of Special Diet Block, R.N.B., Londonderry.

EXAMPLES OF WORK CARRIED OUT BY CASES OF HEALED PEPTIC ULCER IN THE ROYAL NAVAL BASE, LONDONDERRY.

PLATE VII.

Engineering Workshop.

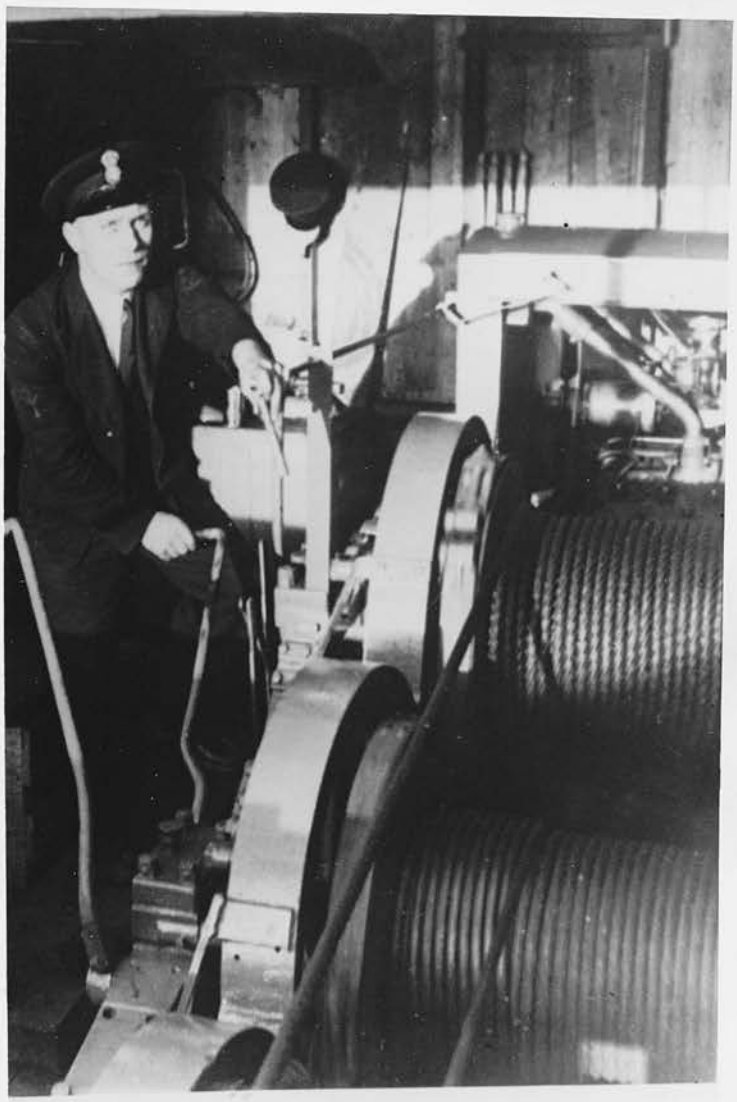
PLATE VIII.

Supervision of Evaporating Plant.

PLATE IX.

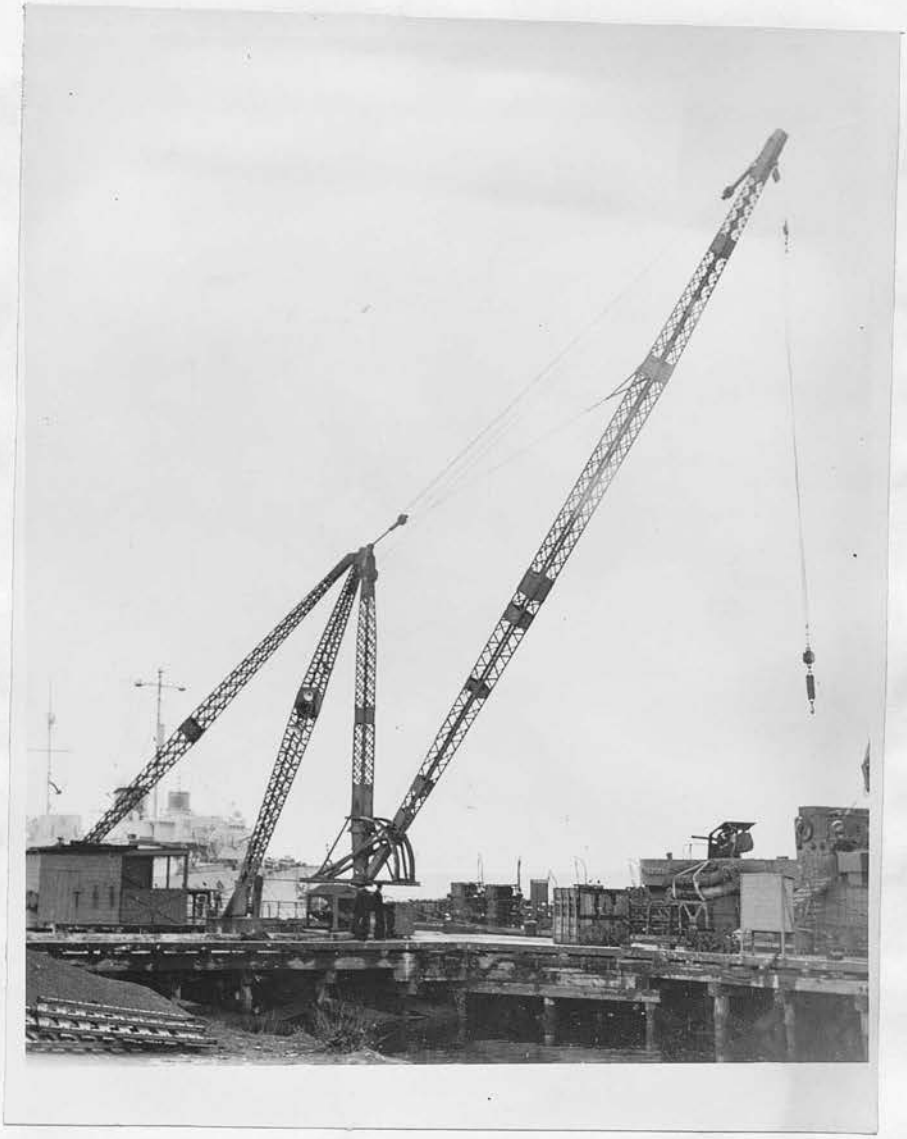
Harbour Boat Work.

PLATE X.



Crane Driving.

PLATE XI.



Crane Driving.

PLATE XII.

Seamanship Instructor.

II. (a) DIETS USED IN THE TREATMENT OF CASES OF PEPTIC ULCER IN HOSPITAL.

G.1. Two Hourly Liquid or Semi Solid Feeds.

0730. Two tablets ascorbic acid or watery solution of powder equivalent to 100 mgm: ascorbic acid.

0800. A small cupful of porridge with milk and cream (and sugar if desired).

1000. A glass of milk to be sipped slowly.

1200. Potato soup (small cupful), vegetable puree, or cup of warm marmite made with water. A small portion (3-oz) boiled or roast breast of chicken minced, tender grilled steak minced, or steamed or boiled white fish. Rusks (2 or 3), crisp toast or bread and butter.

1400. A glass of milk to be sipped slowly.

1600. A cup of milk flavoured with tea and sugar. A small cupful of boiled rice, custard, macaroni, cornflour, arrowroot, with sugar, or jelly flavoured with fruit juice.

1800. A lightly boiled egg, or buttered egg in cup. 2/3 half slices thin bread and butter.

2000. A glass of milk to be sipped slowly.

NOTE:- Jelly, syrup, or treacle may be used to flavour rice at 1600. If patient is thirsty or extra fluid required (the above diet contains approx: 40-ozs. fluid), this shall be made up by water or milk to the desired amount. No condiments are allowed. All food must be chewed carefully and the mouth rinsed and kept clean. A teaspoonful of Alkaline powder in water is to be given if pain is complained of, and the time noted, but it is not to be given routinely. If the bowels do not act, an enema may be required on alternate days and small doses of liquid paraffin ordered.

G.2. Light Meals and Feeds.

0800. Breakfast: A lightly boiled, or poached, or scrambled egg. Two thin half slices of toast, or bread and butter. A cup of milk flavoured with tea and sugar.

1000. A glass of milk to be sipped slowly.

1230. Lunch or dinner: A small portion (3-oz) boiled or roast chicken, steamed, boiled or grilled white fish, tender steak or chop, tripe, calve's heart or liver. Two heaped tablespoons of mashed creamed potato. A glass of milk.

1430. A glass of milk to be sipped slowly.

1630. A cup of milk flavoured with tea and sugar. Bread and butter. Small portion of plain sponge cake.

1830. Dinner or Supper: A glass of milk with rice, macaroni, cornflour, or other milk puddings.

2000. A glass of milk to be sipped slowly.

NOTE:- The instructions for modification of the above diet and for extras, are the same as in G1. diet.

G.3. Intermediate Diet.

Breakfast: Small portion of porridge with milk or cream, and sugar. Bread or toast, and butter and marmalade. A lightly boiled, poached or scrambled egg, a cup of tea with milk and sugar.

1030-1100. A glass of milk with cracker biscuits or rusks.

Lunch or Dinner: Fish, chicken, game, beef chop, steak, mutton or lamb (4-oz) Boiled or baked potato or mashed cream potato. A small milk pudding. Milk or water to drink.

Tea: A cup of tea with milk and sugar. Bread and butter. Jelly. Plain cake.

Dinner or Supper: Cold meat or tongue, boiled or grilled fish. Bread and butter, puree of prunes, apple, or other fruit, flavoured with milk and sugar.

2100. A glass of milk.

NOTE:- The patient should rest lying down for half an hour before and after the three principal meals, and eat slowly, chewing all food carefully. After the first week, sieved vegetable should be added to the midday meal with the meat and potato, and after a further week, ordinary cooked vegetables allowed. Similarly with the evening meal, after a week the fruit need not be sieved provided the skins and pips are avoided.

Full Diet Suitable for Patients with Indigestion. (Diet G.4)

Ordinary food should be taken subject to reservations. The patients should be thoroughly familiar with the requirements which are as follows.-

1. No roughage. This means that the pips and skins of fruit and vegetable fibre must be removed by sieving before they are suitable. The gristle and tough indigestible portions of meat also should be avoided. Such items as lettuce, celery, cucumber, radishes, should not be taken.

2. No irritants. This means no hot gravies, pickles, pepper, mustard, vinegar, spices, and strong hot tea or coffee.

3. Regular meal hours. The principle meals of the day should be supplemented by snacks in the middle of the morning, afternoon and at bedtime. The most suitable foods at these times are milk and biscuits or bread and butter, but cocoa made with milk or Horlicks may be substituted.

4. Overeating. Overeating at one meal is as bad as going for long periods without food. Both are harmful. It is much better to eat more often and in moderation.

5. Food fads. It is a mistake to avoid certain foods on the principle or because you have read somewhere that they are harmful. Fresh fruit, vegetables, meat etc. are necessary and should be taken whenever they are available, provided the instructions under para 1 are followed. The only valid reason for avoiding anything, e.g. cheese, would be individual experience that it has caused indigestion. Narrowing the diet down to milk, bread, tea, milk puddings, fish etc. as so many people do is harmful because it is likely to lead to loss of weight and deficiency of vitamins, and this may promote the recurrence of indigestion.

6. Care during periods of extra work causing strain and fatigue or excitement. Worry, excitement, disappointment and fatigue are known to be often associated with recurrence of indigestion, and at such times it is best to eat lighter meals and to avoid beef, pork, pastry, fries or other greasy foods and to substitute a diet more on the lines of the G.3 type, if possible allowing a short break for rest before and after the principle meals. At these times powder may be taken if discomfort or/

or indigestion is felt, 1 teaspoonful at a time in a little water, but the tendency to swallow air (which increases indigestion) must be avoided by chewing gum or placing a matchstick between the teeth.

7. Tobacco and Alcohol. Some advise stopping both tobacco and alcohol but many persons who take neither get indigestion. It is probably best to avoid smoking before meals but no hard and fast rule can be made, and it is advisable to reduce cigarettes to 10 a day and pipe smoking to 1-2 ozs. a week.

The same should be applied to alcohol - drinking on an empty stomach and excessively obviously being undesirable.

II (b) RANDOM SAMPLES OF DIETS SUPPLIED IN THE SPECIAL DIET MESSES AT BELFAST AND LONDONDERRY.

MENU. W/E 28th October 1944.

Date	Breakfast	Dinner	Tea	Supper
Sunday 22/10/44	Wheat Flakes Poached Egg Toast Tea Bread & Butter	Roast Beef Potatoes Veg. Stewed Prunes Custard	Bread & Butter Jelly Tea	Cold Ham Cheese Ovaltine Bread & Butter
Monday 23/10/44	Shredded Wheat Boiled Egg Tea Marmalade Bread & Marg.	Ox Hearts Potatoes Veg. Rice Pudding	Bread & Marg. Jam Cake Tea	Minced Beef Potatoes Veg. Tea Bread & Marg.
Tuesday 24/10/44	Wheat Flakes Scrambled Egg Toast Tea Bread & Marg.	Roast Lamb Potatoes Veg. Golden Pudding Syrup Sauce	Bread & Marg. Swiss Roll Tea	Steamed Fish Parsley Sauce Potatoes Ovaltine Bread & Marg.
Wednesday 25/10/44	Shredded Wheat Poached Egg Toast Tea Bread & Butter	Rabbits Potatoes Veg. Trifle	Bread & Butter Jam Buns Tea	Harricot Mutton Veg. Tea Bread & Butter
Thursday 26/10/44	Porridge Kippers Tea Bread & Marg.	Steamed Lamb Chops Potatoes Veg. Stewed Apples Custard	Bread & Marg. Jam Cake Tea	Liver Potatoes Veg. Tea Bread & Marg.
Friday 27/10/44	Wheat Flakes Boiled Egg Tea Marmalade Bread & Butter	Giblet Soup Roast Chicken Potatoes Veg. Chocolate Pudding Custard Sauce	Bread & Butter Jam Buns Tea	Boiled Ham Potatoes Veg. Chocolate Bread & Butter
Saturday 28/10/44	Shredded Wheat Poached Egg Toast Tea Bread & Marg.	Steamed Fish Parsley Sauce Potatoes Veg. Tapioca Pudding	Bread & Marg. Jam Cake Tea	Roast Beef Potatoes Veg. Tea Bread & Marg.

Milk & Biscuits issued at 1015
" " " 1415
" " " 2100

MENU. W/E 6th January 1945.

Date	Breakfast	Dinner	Tea	Supper
Sunday 31st Dec.	Shredded Wheat Boiled Egg Marmalade Tea Bread & Butter	Roast Lamb Potatoes Cabbage Rice Pudding	Bread & Butter Swiss Roll Tea Bread & Butter	Boiled Ham Cheese Ovaltine Bread & Butter
Monday 1st Jan.	Wheat Flakes Poached Egg Toast Tea Bread & Marg.	Beef Stew Potatoes Turnips Tapioca Pudding	Cake Jam Tea Bread & Marg.	Welsh Rarebit Baked Potatoes Tea Bread & Marg.
Tuesday 2nd Jan.	Porridge Kippers Marmalade Tea Bread & Butter	Rabbit Potatoes Carrots Marmalade Pudding Custard Sauce	Buns Tea Bread & Butter	Minced Beef Potatoes Tea Bread & Butter
Wednesday 3rd Jan.	Shredded Wheat Boiled Egg Tea Bread & Marg.	Steamed Fish Potatoes Cabbage Sultana Pudding Custard Sauce	Cake Jam Tea Bread & Marg.	Liver Potatoes Chocolate Bread & Marg.
Thursday 4th Jan.	Wheat Flakes Poached Egg Toast Tea Bread & Butter	Roast Beef Potatoes Cauliflower Rice Pudding	Swiss Roll Tea Bread & Butter	Herrings Potatoes Tea Bread & Butter
Friday 5th Jan.	Porridge Boiled Egg Tea Bread & Marg.	Roast Chicken Potatoes Sprouts Prunes Custard Sauce	Jelly Custard Tea Bread & Marg.	Boiled Beef Carrots Tea Bread & Marg.
Saturday 6th Jan.	Wheat Flakes Poached Egg Toast Tea Bread & Marg.	Steamed Fish Potatoes Carrots Apricot Pudding Custard Sauce	Cake Tea Jam Bread & Marg.	Cold Roast Beef Baked Potatoes Tea Bread & Marg.

Milk & Biscuits at 1015
" " " " 1415
" " " " 2100

KEY:

(1) Rating and Class - Non.subst. and Subst. R.F.R. A/S. H/O etc.

(2) Date of Draft: e.g. H.M.S. Ferret 10.6.44.

(3) Meals: i.e. meals consumed in gastric mess - breakfast, dinner and supper for one week = 21 meals. Record attendance as fraction e.g. 19/21.

(4) T & R. Tobacco and Rum taken up. If cigarettes only record as "T", if T & R record as "TR" if neither record as "0".

(5) Days off duty - i.e. off work because of dyspepsia, e.g. "3".

(6) Days off with other diseases, e.g. cold, injury etc. e.g. "0".

(7) In hospital - record number of days only when in hospital with recurrence of Dyspepsia.

(8) Powders: record simply "+" or "0" depending on patient's statement.

(9) Weight : in lb. stripped (or with drawers on only).

(10) Symptoms - brief note made at weekly interview. Re pain note especially if related to food and occurring at definite time after food (P_1) or continuous ache (P_2) sharp colicky pain (P_3) or vague discomfort (P_4). Note any recognised relation of pain or other symptoms to irregular meals (on leave), alcohol, worry, frustration.

III. SAMPLE OF WEEKLY RECORD SHEET USED FOR CASES EMPLOYED IN THE EXPERIMENT.

NO._____ NAME:_____ AGE:_____ RATING AND CLASS._____

DATE OF DRAFT TO H.M.S._____ QUARTER END_____

Item													
T & R													
Days off duty with dyspepsia.													
Ditto other Diseases													
Ditto in Hosp. with Dyspepsia													
Ditto on Leave													
Powders													
Weight													
SYMPTOMS (Weekly Review)													

IV. EXAMPLE OF ACTUAL WEEKLY MEAL RECORDS FROM THE SPECIAL DIET MESS AT BELFAST.

Week Ending 14.1.45. inclusive.

P.O's.	66	66	63	52	247	10.10. 9. 9. 9. 9. 9.	260
2	14	14	14	5	51	2. 2. 2. 2. 2. 2. 2.	56
3	35	35	32	24	126	5. 5. 5. 5. 5. 5. 5.	140
4	38	37	34	27	136	5. 5. 5. 6. 6. 5. 5.	148
				TOTAL.	560		TOTAL. 604

Meals Provided = 604.
Meals Consumed = 560
% = 92.9.

Week Ending 21.1.45. inclusive.

P.O's.	64	65	65	54	248	9. 9. 9. 9. 9.10.10.	160
2	15	14	15	12	56	2. 2. 2. 2. 2. 3. 2.	60
3	35	35	33	24	127	5. 5. 5. 5. 5. 5. 5	140
4	35	35	34	32	136	5. 5. 5. 5. 5. 5. 5.	140
				TOTAL.	567		TOTAL. 600

Meals Provided = 600
Meals Consumed = 567
% = 94.5.